KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with 'A' Grade Status – 3.64CGPA out of 4 (3rdCycle)
College of Excellence (UGC)

COIMBATORE – 641 029, TAMIL NADU, INDIA.

SYLLABI FOR B.Sc BIOCHEMISTRY

DEPARTMENT OF BIOCHEMISTRY

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)
(2018 - 2019 and onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
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College of Excellence (UGC)
COIMBATORE – 641029, TAMIL NADU, INDIA.

VISION AND MISSION OF THE COLLEGE

Vision:

Developing the total personality of every student in a holistic way by adhering to the principles of Swami Vivekananda and Mahatma Gandhi.

Mission:

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education.

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DEPARTMENT OF BIOCHEMISTRY (UG) -VISION & MISSION

Vision:

- To promote goal-oriented innovative teaching, interdisciplinary research by interfacing biochemistry with modern and applied biology to address problems affecting human health and welfare.
- Training scholars to be the next generation scientists

Mission:

- To generate new knowledge by teaching and engaging in cutting edge research and to promote academic growth by offering state of the art under graduate, post graduate and doctoral programmes.
- To identify, based on an informed perception of regional and global needs, area of specialization upon which the department can concentrate.
- To undertake collaborative projects which offer opportunities for long term interaction with academia and industries

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DEPARTMENT OF BIOCHEMISTRY

UG PROGRAMME OUTCOME

PO1: To presume, question and evaluate, solve problems, integrate knowledge and widen perspective.

PO2: To understand that communication comprises attentiveness and listening, reading and comprehension, to communicate and collect information through oral and written formats.

PO3: To apply contemporary research methods, skills and techniques in a scientific discipline.

PO4: To reveal empathetic social concern and national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5: To understand the issues of environmental contexts and sustainable development and to engage in independent and life-long learning.

PO6: To acquire a broad foundation in chemical processes that stresses scientific reasoning and analytical problem solving with a molecular and biological perspective.

PO7: To develop the ability to think logically and clearly by articulation of thoughts, critical evaluation of experimental data and scientific literature.

PO8: To inculcate research culture in consonance with current trends in the field of biochemistry so as to develop broad scientific knowledge in the students.

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COIMBATORE – 641 029, TAMIL NADU, INDIA.

DEPARTMENT OF BIOCHEMISTRY

UG PROGRAMME SPECIFIC OUTCOME

PSO1: Understanding of structure and metabolism of macromolecules, regulation and disorders of metabolic pathways.

PSO2: Investigate the impact of science in society and plan to pursue research

PSO3: Gain proficiency in laboratory techniques in both Biochemistry and molecular biology and be able to apply the scientific method to the processes of experimentation and hypothesis testing.

PSO4: Understand the application of Biochemistry in clinical laboratory.

PSO5: Acquire thorough knowledge in biochemical techniques, immunology, physiology, molecular biology, genetic engineering and biotechnology.

UBC-1

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with 'A' Grade Status – 3.64 CGPA (3rd Cycle)

College of Excellence (UGC)

Coimbatore - 641029.Tamil Nadu, India

Course Name: B.Sc. Biochemistry

Curriculum and Scheme of Examination under CBCS

(Applicable to Students Admitted for the Academic Year 2018-2019)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam (hours)	Credits
					CIA	ESE	TOTAL		
I	I	18TML101	Language I@	6	25	75	100	3	3
	II	18ENG101	English –I	6	25	75	100	3	3
	III	18UBC101	C.P.1 Chemistry of Biomolecules	7	25	75	100	3	6
		-	C. Pr. I - Biochemistry	2	-	-	-	-	-
		18UZO1A1	Allied A1- Zoology I	5	20	55	75	3	4
		-	A. Pr. 1 Zoology	2	-	-	-	-	-
	IV	**18EVS101**	**Environmental Studies****	**2**	**-**	**50**	**50**	**3**	**2**
II	I	18TML202	Language II@	6	25	75	100	3	3
	II	18ENG202	English –II	6	25	75	100	3	3
	III	18UBC202	C.P.2 Bioanalytical Techniques	7	25	75	100	3	6
		18UBC2CL	C.Pr. 1 Biochemistry	2	40	60	100	3	2
		18UZO2A2	Allied A. 2 Zoology II	5	20	55	75	3	4
		18UZO2AL	A. Pr. 1 Zoology	2	20	30	50	3	2
	IV	**18VED201**	**Value Education- Moral and Ethics****	**2**	**-**	**50**	**50**	**3**	**2**
III	I	18TML303	Language III@	6	25	75	100	3	3
	II	18ENG303	English –III	6	25	75	100	3	3
	III	18UBC303	C. P. 3 – Enzymes and Enzyme Technology	4	25	75	100	3	5
		-	C.Pr. 2 Biochemistry	3	-	-	-	-	-
		18UCH3A3	Allied B. 1. Chemistry I	5	20	55	75	3	4
		-	A.Pr.2 Chemistry	2	-	-	-	-	-
	IV	**18UGA3S1**	**Skill Based Subject 1- General Awareness**	**2**	**25**	**75**	**100**	**3**	**3**
		18TBT301/ 18TAT301/ 18UHR3N1	**Basic Tamil* Advanced Tamil** (OR) Non-Major Elective- I****	**2**	**75**		**75**	**3**	**2**
IV	I	18TML404	Language IV@	6	25	75	100	3	3
	II	18ENG404	English –IV	6	25	75	100	3	3
	III	18UBC404	C. P. 4 Intermediary Metabolism	4	25	75	100	3	4
		18UBC4CM	C. Pr.2. Biochemistry	3	40	60	100	3	2
		18UCH4A4	Allied B.2 Chemistry II	5	20	55	75	3	4
		18UCH4AL	A. Pr.2. Chemistry	2	20	30	50	3	2

UBC-2

	IV	**18UBC4S2**	**Skill Based Subject 2- Common Human Diseases**	**2**	**25**	**75**	**100**	**3**	**3**
		18TBT402/ 18TAT402/ 18UWR4N2	**Basic Tamil*/ Advanced Tamil** (OR) Non-Major Elective- II****	**2**	**75**		**75**	**3**	**2**
V	III	18UBC505	C.P.5 Human Physiology	4	25	75	100	3	4
		18UBC506	C.P.6 Cell Biology	4	25	75	100	3	4
		18UBC507	C.P.7 Clinical Biochemistry	4	25	75	100	3	4
		18UBC508	C.P.8 Molecular Biology	4	25	75	100	3	4
	III	**18UBC5E1**	**Major Elective I**	4	**25**	**75**	**100**	**3**	**5**
	III	-	C.Pr.3. Biochemistry	4	-	-	-	-	-
		-	C.Pr.4. Biochemistry	2	-	-	-	-	-
		-	C.Pr.5. Biochemistry	2	-	-	-	-	-
	IV	**18UBO/UZO/ UBT5X1**	**Extra Departmental Course**	**2**	**25**	**75**	**100**	**3**	**3**
	-	**18UBC5IT**	**Internship Training**	**Grade ******					
VI	III	18UBC609	C.P.9 Plant Biochemistry	4	25	75	100	3	4
		18UBC610	C.P.10 Immunology and Immuno Techniques	4	25	75	100	3	4
		18UBC611	C.P.11 Genetic Technology	4	25	75	100	3	4
	III	**18UBC6E2**	**Major Elective II -**	4	**25**	**75**	**100**	**3**	**5**
		18UBC6Z1	**Project ***	4	**20**	**80**	**100**	-	**5**
	III	18UBC6CN	C.Pr.3. Biochemistry	4	40	60	100	6	3
		18UBC6CO	C.Pr.4. Biochemistry	2	40	60	100	4	2
		18UBC6CP	C.Pr.5. Biochemistry	2	40	60	100	4	2
	IV	**18UBC6S4**	**Skill Based Subject 4- Techniques in Genomics and Proteomics**	**2**	**25**	**75**	**100**	**3**	**3**
	V	**18NCC / NSS / YRC / PYE101**	**Extension Activities***	-	**50**	-	**50**	-	**1**
Total				**180**			**3800**		**140**

@
Hindi/Malayalam/ French/ Sanskrit – 18HIN/18MLM/18FRN/18SAN101 - 404 ***** - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA) ****** - No Continuous Internal Assessment. Only End-of-Semester Examinations (ESE)
***- Project Report – 60 marks; Viva voce – 20 marks; Internal – 20 marks
****- The students shall undergo an Internship training/field work for minimum period of 2 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva voce by the respective faculty. According to their marks, the grades will be awarded as given below.

Marks%	Grade
85-100	O
70-84	D
60-69	A
50-59	B
40-49	C
<40	U (Reappear)

UBC-3

Major Elective Papers

(2 papers are to be chosen from the following 6 papers)

1. Microbiology
2. Biotechnology
3. Advanced Clinical Biochemistry
4. Principles of Pharmacology
5. Basics of Bioinformatics
6. Dairy Biochemistry

Non-Major Elective Papers

1. Human Rights
2. Women's Rights
3. Consumer affairs

List of Extra Departmental Courses

1. 18UBO5X1 Medicinal botany
2. 18UZO5X1 Ornamental fish culture technology
3. 18UBT5X1 Molecular diagnostics

Certificate Course

1. Mushroom Technology

Tally Table:

S.No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2.	II	English	400	12
3.	III	Core – Theory/Practical/Project	1700	65
		Allied (4)	400	20
		Major Electives (2)	200	10
4.	IV	Basic Tamil / Advanced Tamil (OR) Non-major electives	150	4
		Skill Based subjects (4)	400	12
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Extension Activities NCC/NSS/YRC/PYE	50	1
		Total	**3800**	**140**

Note :

CBCS – Choice Based Credit System
CIA – Continuous Internal Assessment

UBC- 4

ESE – End of Semester Examinations

25 % CIA is applicable to all theory subjects except JOC, COP and Diploma Courses, which are considered as extra credit courses.

UBC-5

18UBC101

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC101		Core Paper 1 – CHEMISTRY OF BIOMOLECULES		
Batch 2018-2019	Semester I	Hours / Week 7	Total Hours 105	Credits 6

Course Objectives

1. To learn the chemistry and structure of different biomolecules
2. To understand the biological significance of different biomolecules

Course Outcomes (CO)

K1	CO1	Define the functions and properties of carbohydrates, lipids, amino acids, proteins and nucleic acids
K2	CO2	Classify the biomolecules according to their structures
K3	CO3	Sketch the basic structure of biomolecules and reactions involving them
K4	CO4	Distinguish different types of sugars, fats, amino acids and proteins based on the physical, chemical and biological aspects

Total hours: 105

UNIT I (21 hrs)

Carbohydrates

Carbohydrates**:** Definition and Classification. Monosaccharides – Structural aspects-asymmetric carbon atom, D and L isomers, anomers, optical activity and mutarotation. Epimers: pyranose and furanose forms, aldo and keto forms, classification, definition, structure and biological importance. Hexoses: glucose, fructose, galactose and mannose. Pentoses: Ribose and deoxyribose. Disaccharides: Maltose, sucrose and lactose.

UBC-6

18UBC101

Polysaccharides: Homopolysaccharides: Starch, glycogen, cellulose, inulin and chitin, Heteropolysaccharides: Heparin, hyaluronic acid, chondroitin sulphates. Reactions of monosaccharides- Oxidation of glucose (aldonic acid, aldaric acid and uronicacid).

Action of alkalies with sugars,reducing action of sugars in alkaline solution and reaction with phenyl hydrazine.

UNIT II (21 hrs)

Lipids: Classification and properties of lipids. Types of fatty acids: saturated and unsaturated: essential fatty acids. Classification and significance of phospholipids: Phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine, phosphatidyl inositol and sphingomyelin.

Classification and significance of glycolipids: Cerebrosides and gangliosides. Classification and functions of lipoproteins*. Structure and biological functions of cholesterol.

UNIT III (21 hrs)

Amino acids:

Introduction; definition; classification of amino acids based on structure, side chain metabolism and nutritional requirements. Properties of amino acids – ampholyte and isoelectric point, optical activity. General reactions of amino acids: due to carboxylic group – decarboxylation and amide formation; due to amino group – transamination and oxidative deamination; due to side chain – transmethylation and ester formation.

UNIT IV (21 hrs)

Proteins:

Introduction, general properties, classification and functions.Bonds relating to protein structure – strong bonds (peptide and disulphide bonds) - weak bonds(hydrogen and hydrophobic bonds). Elementary treatment on structure of proteins – primary, secondary, tertiary and quaternary structure.

Denaturation and Renaturation.

UNIT V (21 hrs)

Nucleic acids:

Introduction; Types of nucleic acids; Structure of purine (A and G) and pyrimidine (C,U,T, dihydrouridine and pseudouridine) bases.

UBC-7

18UBC101

Structure of nucleotides – AMP, dAMP , GMP, dGMP, CMP, dCMP , dTMP , UMP.

Structure of DNA – Watson and Crick model.

Structure of RNA – mRNA, tRNA and rRNA.

Denaturation and Renaturation.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books

1. U. Satyanarayana and U. Chakrapani (2013). Biochemistry. Elsevier and Books & Allied (P) Ltd. Kolkata.

2. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7th ed., Published by the Author, Chennai – 600 035.

3. Deb, A.C. (2011), Fundamentals of Biochemistry, 10th ed., New Central Book Agency Pvt. Ltd., Kolkata 700 009.

Reference Books

1. Voet, D., Voet, J.G. and Pratt, C.W. (2013), Fundamentals of Biochemistry, Life at the Molecular Level, 4th ed., John Wiley & Sons, New Delhi, 110002.

2. Vasudevan, DM., Sreekumari, S. and Kannan Vaidyanathan (2011), Text Book of Biochemistry for Medical Students, 6th ed., JAYPEE Brothers Medical Publishers Pvt. Ltd., New Delhi, 110002.

3. Robert K. Murray, Daryl K. Granner and Victor W. Rodwell (2008), 29th ed., Harper's Illustrated

4. Biochemistry. McGraw Hill Companies, Inc. New Delhi.

5. Moran, Horton, Scrimgeour, Perry & Rawn (2013). Principles of Biochemistry, 5th edition Pearson New International Edition, UK.

** Questions may also be taken from the self study portion*

UBC-8

18UBC101

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	H	S	M	S
CO3	S	H	H	S	H
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-9

18UBC2CL

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC2CL		C.Pr.1. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester I & II	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To acquire skill of analyzing carbohydrates and amino acids.
2. To provide practical knowledge about the characterization of lipids.
3. To learn the methodology of separation of amino acids by paper chromatography.

Course Outcomes (CO)

K3	CO1	Practice the qualitative analysis of different carbohydrates and amino acids through individual experiments
K4	CO2	Calculate iodine number of lipids, thereby characterizing them
K5	CO3	Assess the separation technique of amino acids through paper chromatography

Total Hours: 30

Analysis of Biomolecules

I. Qualitative Analysis of Carbohydrates

a. Monosaccharides -Hexoses : Glucose and fructose

-Pentose : Arabinose

b. Disaccharides -Sucrose and Lactose

c. Polysaccharides - Starch

II. Qualitative Analysis of Amino acids

a. Arginine

b. Histidine

c. Tyrosine

d. Tryptophan

e. Cysteine

III. Characterization of Lipids (Group Experiment)

Determination of Iodine number

IV. Separation Technique (Demonstration)

Separation of amino acids by paper chromatography

Reference Books:

1. Jayaraman. J. (2011), Laboratory Manual in Biochemistry, 2nd edition, New age International Pvt, Delhi
2. Gupta. R.C and Bharghava. S (2013), Practical Biochemistry, 5th edition, CBS Publishers and Distributors, New Delhi.
3. David. T. Plummer, (2004), An Introduction to Practical Biochemistry, 3rd edition, TataMcGraw Hill Publishing Company Ltd, New Delhi.
4. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, New Delhi.

UBC-11

18UBC2CL

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	M
CO2	S	S	S	S	H
CO3	S	S	H	S	H
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-12

SEMESTER I

PART IV – ENVIRONMENTAL STUDIES

18EVS101

Total Credits: 2 **Total Hours: 30**

Objectives:

- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good "ecocitizens" thereby catering to global environmental needs.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT (6 hours)

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II ECOSYSTEMS (6 hours)

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem –Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III BIODIVERSITY AND ITS CONSERVATION (6hours)

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – insitu Conservation of Biodiversity – exsitu Conservation of Biodiversity

UNIT IV ENVIRONMENTAL POLLUTION (6 hours)

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UBC-13

18EVS101

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT (6 hours)

Sustainable Development – Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health -.

Self Study (Questions may be asked from these topics also)

Text Book

1.P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

References

1. Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs.Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.

2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi -110 006.

3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001.

UBC-14

18UBC202

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC202		Core Paper 2- BIOANALYTICAL TECHNIQUES		
Batch 2018-2019	Semester II	Hours / Week 7	Total Hours 105	Credits 6

Course Objectives

1. To know the various types of buffer systems in blood and plasma and its significance in the maintenance of blood pH.
2. To understand the principle, materials, methods and applications of chromatography, electrophoresis and colorimetry.
3. To detect and measure the radioactivity and explore its role in biological and clinical fields.

Course Outcomes (CO)

K1	CO1	Recall the definition of acids, bases and buffers.
K2	CO2	Describe the various buffer systems present in blood and plasma, and their role in maintaining the blood pH and various bioanalytical techniques.
K3	CO3	Demonstrate the types and procedures of chromatography, electrophoresis and colorimetry.
K4	CO4	Analyze the separated components in the biological samples by chromatography, electrophoresis and colorimetry.

Total Hours:105

UNIT I (21 hrs)

Acids, bases, pH scale, ionization-pKa, derivation of Henderson - Hasselbalch equation for acids and bases, buffer solutions, buffer systems of blood and RBC, hemoglobin buffer system. pH indicators.

pH meter. Various ways of expressing the concentrations of solutions – normality, molarity and percentage solution*

UNIT II (21 hrs)

Chromatography: Principle, technique and applications of paper, thin layer, column, ion exchange, molecular sieve and affinity chromatography. HPLC and Gas Chromatography- Mass Spectrometry (GCMS) - technique and applications.

UNIT III (21 hrs)

Electrophoresis: Principle, factors affecting, instrumentation and applications of agarose gel, SDS-PAGE, isoelectric focusing and immunoelectrophoresis.

Centrifugation – Svedberg unit, Types-density gradient, differential and ultra centrifuge.

UNIT IV (21 hrs)

Colorimetry –Derivation of Lambert's and Beer law, principle, components, instrumentation and working of a single cell photo electric colorimeter and spectrophotometer. Comparison of colorimeter and spectrophotometer. Applications of colorimeter and spectrophotometer.

UNIT V (21 hrs)

Radioactivity: Types of Radioactive decay, Units of radioactivity(Curie, Rutherford and Becquerrel), detection and measurement of radioactivity by scintilation counter – solid and liquid scintillators, counting efficiency and factors affecting counting efficiency. Advantages and disadvantages of scintillation counting. Autoradiography and applications. Applications of radioisotopes in medical diagnosis, archeology, industries and agriculture.

Teaching Methods

Chalk and Board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Asokan, P (2006), Basics of Analytical Biochemical Techniques, Chinna Publications. Melvisharam, Tamil Nadu.
2. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7th ed., Published by the Author, Chennai – 600 035.

Reference Books:

1. Skoog. D.A., West. D.M, James H. F., Crouch. S.R., (2008), Fundamentals of Analytical Chemistry, 4th edition, Barkha Nath Printers, India.
2. Wilson. K. and Walker. J. (2011), Principles and Techniques of Biochemistry and Molecular Biology, 7thed, Cambridge University Press, New York.

**Question may also be taken from self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	H	S	M	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	H

S – Strong **H** – High **M** – Medium **L** – Low

UBC-17

18VED201

Total Hours: 30

SEMESTER-II

PART-IV VALUE EDUCATION: MORAL AND ETHICS

Total Hours: 30 **Total Credits: 2**

OBJECTIVES:

- To impart the value education in every walk of life.
- To make them understand the relationship between Moral and Ethics.
- To impart the right attitude by practicing self introspection.
- To make them realize about their hidden power within them.
- To develop a knowledge for the steps of upliftment.
- To know about their goal of life.
- To make them understand the importance of yoga and meditation.
- To realize what is the real peace.
- To understand what are the ways to contribute peace to the whole world.
- To goad youth to reach excellence and reap success.

UNIT I: **6hrs**

Introduction – Meaning of Moral and Ethics – Ethics and Culture – Aim of Education.

UNIT II: **6hrs**

Swami Vivekananda – A Biography.

UNIT III: **6hrs**

The Parliament of Religions – Teachings of Swami Vivekananda.

UNIT IV: **6hrs**

Steps for Human Excellence.

UNIT V: **6hrs**

Yoga & Meditation.

Text Book:

Value Base Education – Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), First Edition, 2015.

Reference Book:

Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication, 2000.

UBC-18

18UBC303

Programme Code:07		B.Sc Biochemistry		
Course Code: 18UBC303		Core Paper III – ENZYMES AND ENZYME TECHNOLOGY		
Batch 2018-2019	Semester III	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To perceive knowledge about enzymes and their kinetics.
2. To study about the coenzymes and their roles in the biological system.
3. To know about the recent enzyme technologies and their applications for diagnostic purpose.

Course Outcomes (CO)

K1	CO1	Remember the role of enzymes in biological system
K2	CO2	Acquire thorough knowledge on the enzyme kinetics and inhibition.
K3	CO3	Deploy the properties and functions of coenzymes and cofactors.
K4	CO4	Analyze the biological importance of immobilized enzymes and biosensors.

Total Hours :60

UNIT I (12 Hrs)

Enzymes: Introduction, Definition, International Classification of enzymes, Numbering and nomenclature. Enzyme unit (IU). Principles of enzyme catalysis. Definition of active sites. Theories proposed – Lock and Key or template model and induced fit model, ordered and random binding of substrate. Enzyme specificity – Group specificity and optical specificity.

Enzyme activity and factors affecting the rate of enzyme activity – effect of temperature, pH, enzyme concentration and substrate concentration.

UNIT II (12 Hrs)

Enzyme Kinetics: Derivation of Michalies-Mentons equation, transformation of MM equation, Line-Weaver Burk plot. Regulatory enzymes, allosteric enzymes.

Enzyme inhibition: competitive, non-competitive and uncompetitive enzyme inhibition. Feedback inhibition.

UNIT III (12 Hrs)

Coenzymes: Definition; structure and functions of thiamine pyrophosphate, nicotinamide adenine dinucleotide, nicotinamide adenine dinucleotide phosphate, flavin mono nucleotide, flavin adenine dinucleotide, coenzyme A, lipoic acid, biotin and folate coenzymes. Cofactors**:** Definition and Examples*

UNIT IV (12 Hrs)

Enzyme technology: Immobilized enzymes: sources and techniques of immobilization – adsorption, entrapment, microencapsulation, covalent binding and cross linking. Choice of immobilization techniques. Industrial, analytical and medicinal applications of immobilized enzymes.

UNIT V (12 Hrs)

Uses of enzymes in analysis: Enzymes of diagnostic importance, Isoenzymes: Definition with example – Lactate dehydrogenase.

Biosensors: Principle, types and components of Calorimetric, potentiometric, optical and immunosensors. Artificial enzymes: abzymes, synzymes and ribozymes.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Anil Kumar & Sarika Garg, (2015), Enzymes and Enzyme Technology, Viva books, New delhi**.**

2. U. Sathyanarayana (2013). Biochemistry 4th edition. Elsevier health sciences. Elsevier India.

Reference Books:

1. D. Balasubramanyam, CFA. Bryce, K. Dharmalingham, J. Green, KunthalaJayaraman, (2007), Concepts in Biotechnology, Universities Press (India) Pvt Ltd, Hyderabad.

2. Talwar. G.P (2012), Text book of biochemistry and Human Biology, 3rd edition, Prentice Hall of India Private Ltd, New Delhi.

3. EE. Conn and PK. Stumpf, G. Bruening and RY. Doi (2010), Outlines of biochemistry, 5th ed, John Wiley and Sons, New York, USA.

4. David L Nelson, Micheal M Cox (2008), Lehninger's Principles of Biochemistry, Replika press (P) Ltd, India.

5. Palmer & Bonner(2007).Enzymes, Biochemistry, Biotechnology, Clinical Chemistry, 2nd Ed, Elsevier publications, India.

6. Nicholas C. Price and Lewis Stevens (2003). Fundamentals of enzymology. Oxford university press. New York.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	S
CO2	S	S	S	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-21

18UBC4CM

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC4CM		**Title:** C.Pr.2 BIOCHEMISTRY		
Batch 2018-2019	Semester III & IV	Hours / Week 3	Total Hours 90	Credits 2

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Recalling the preparation of reagents.
K2	CO2	Understanding the principles of techniques.
K3	CO3	Carrying out the experiments using various techniques.
K4	CO4	Techniques are used to analyse the components both qualitatively and quantitatively.

Total Hours :30

List of Programs

I. COLORIMETRY

1. Estimation of glucose - Ortho-Toludine method.

2. Estimation of Phosphorus - Fiske &Subbarrow method.

3. Estimation of urea – DAM – TSC method.

4. Estimation of protein - Lowry's method.

5. Estimation of creatinine – Alkaline- Picrate method.

II. PREPARATION OF BUFFER SOLUTIONS [Group experiment]

1. Preparation of buffer solutions.

   a. Acetate buffer - pH range- 3.6 - 5.6.

   b. Phosphate buffer - pH range- 5.8 - 8.0.

2. Determination of pH using pH meter.

III. ENZYMOLOGY

a. Effect of pH on the activity of **acid phosphatase**

b. Effect of temperature on the activity of **acid phosphatase**

c. Effect of enzyme concentration on the activity of **acid phosphatase**.

d. Effect of substrate concentration on the activity of **acid phosphatase**

e. Determination of **acid phosphatase** activity

IV.TECHNIQUE (Demonstration Experiments)

1) Determination of absorption maximum (λ max) of any two biochemical substances

using UV-VISIBLE Spectrophotometer.

2) Identification of any two nucleic acid bases using UV -VISIBLE Spectrophotometer.

Reference Books

Jayaraman. J. (2011), Laboratory Manual in Biochemistry, 2nd edition, New age International Pvt, Delhi

1. Gupta. R.C and Bharghava. S (2013), Practical Biochemistry, 5th edition, CBS Publishers and Distributors, New Delhi.
2. David. T. Plummer, (2004), An Introduction to Practical Biochemistry, 3rd edition, TataMcGraw Hill Publishing Company Ltd, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	H	S	H
CO3	S	S	S	S	H
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-24

Part IV – III Semester

Skill Based Subject 1 – GENERAL AWARENESS (ONLINE)

(2018 – 2019 Batch Onwards)

18UGA3S1

Teaching hours: 30 **Credits: 3**

Objectives

- To acquire knowledge in relation to various competitive examinations.
- To create awareness about an online examination which is being followed in competitive examinations.

UNIT I (6 hrs)

1. **Tamil and other Literatures**

   Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

2. **Economics and Commerce**

   Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

3. **Social studies**

   Indian History – Inventions – Indian Poetry – Constitution - Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

UNIT II (6 hrs)

4. **Numerical Aptitude**

   Objective Arithmetic : Number systems – probability – HCF and LCM of numbers - decimal fractions – simplification – square roots and cube roots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, volume and surface area**.**

5. **Verbal Aptitude**

   Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

6. **Abstract Reasoning**

   Logic Reasoning: Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

   Non – verbal Reasoning: Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

UNIT III (6 hrs)

7. **General Science and Technology**

SCIENCE- Basic principles and concepts in Physics, Chemistry, Botany and Zoology.
TECHNOLOGY - Metallurgy, instrumentation, discoveries and inventions of techniques.

8. Computer Science

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.

9. Education

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis – Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counselling.

UNIT IV (6 hrs)

10. Library and Information Science

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

11. Sports and Games

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

12. Current Affairs

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

UNIT V (6 hours)

13. National Cadet Corps (NCC)

Introduction to the Armed Forces (Army, Navy, Air Force) – Dril – Weapon Training – Map Reading – Civil Defence.

14. National Service Scheme (NSS)

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrational setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

15. Youth Red Cross (YRC)

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC – Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

Text Book

1. General Awareness, Question Bank, Kongunadu Arts and Science College, Coimbatore, First Edition 2014.

UBC-26

SEMESTER - III

PART IV -NON MAJOR ELECTIVE –I HUMAN RIGHTS

Total Hours of Teaching : 30 **Total Credits : 2**

Objectives:

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

UNIT – I

Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

UNIT – II

United Nations Charter and Human Rights - U.N.Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

UNIT – III

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

UNIT – IV

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights.

UNIT – V

Rights of Women, Child, Refugees and Minorities - Media and Human Rights - NGO's in protection of Human Rights - Right to Election

Books for Study:

1. Human Rights	Compiled by Dr.V.Sugantha, Dean(Unaided), Kongunadu Arts and Science College, Coimbatore –29.

Book for Reference:

1. Human Rights, Humanitarian Law and Refugee Law	Jaganathan,MA.,MBA.,MMM.,ML.,ML., J.P.Arjun Proprietor,Usha Jaganathan law series, 1st floor, Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai – 625014.
2. Promoting Women's Rights As Human Rights	Publisher : United Nations. New York., 1999.

UBC-28

SEMESTER-IV

NON MAJOR ELECTIVE-II WOMEN'S RIGHTS

Total Hours of Teaching: 30 **Total Credits: 2**

Objectives:

- To know about the laws enacted to protect women against violence.
- To impart awareness about the hurdles faced by women.
- To develop a knowledge about the status of all forms of women to access to justice.
- To create awareness about women's rights.
- To know about laws and norms pertaining to protection of women.
- To understand the articles which enables the women's rights.
- To understand the Special Women Welfare laws.
- To realize how the violence against women puts an undue burden on health care services.

Unit I (6hrs)

Laws, Legal System & Change

Definition- Constitutional law, CEDAW and international human rights-law and norms-laws and social context-constitutional and legal frame.

Unit II (6hrs)

Politics of Land and Gender in INDIA

Introduction-faces of poverty-land as productive resources-locating identities-women's claim to land –rights of properties-case studies.

Unit III (6hrs)

Women's Rights: Access to Justices

Introduction-criminal law-crime agent women-domestic violence-dowry related harassment and dowry deaths-molestation-sexual abuse and rape-loopholes in practice-laws enforcement agency.

Unit IV (6hrs)

Women's Right

Violence against-women-domestic violence-the protection of women from domestic violence act, 2005-The Marriage Validation Act, 1982-The Hindu Widow Re-marriage Act, 1856 - The Dowry Prohibition Act, 1961.

Unit V (6hrs)

Special Women Welfare Laws

Sexual harassment at work place-rape and indecent representation-the indecent representation act, 1956-acts enacted for women development and empowerment-role of rape crisis center.

Book for study : Published by Kongunadu Arts & Science College, 2011.

Books for reference:

1. Good Women do not Inherit land - Nitya Rao, Social Science Press and Orient Blackswan (2008).
2. Knowing Our Rights - An Impart for Kali for Women (2006). International solidarity network.
3. Women Rights - P.D.Kaushik, Bookwell Publications (2007).
4. Violence Protective Measures for Women Development and Empowerment - Aruna Goal, Deep and Deep Publications Pvt. (2004).
5. Gender Justice - Monika Chawla, Deep and Deep Publications Pvt. (2006).
6. Domestic Violence Against Women - Preeti Mishra, Deep and Deep Publication Pvt. (2007).
7. Violence against Women - Clair M. Renzetti, Jeffrey L. Edleson, Raquel Kennedy Bergen, Sage Publications (2001).

UBC-30

Programme Code: 07	B.Sc Biochemistry		
	Title: Non- Major Elective – Consumer Affairs		
Batch 2018-2021	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards.
3. To have a handle the business firms interface with consumers and the consumer related regulatory and business environment.

UNIT I **(15 Hours)**

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

UNIT II **(15 Hours)**

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UBC-31

UNIT III **(15 Hours)**

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.

Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV **(15 Hours)**

Role of Industry Regulators in Consumer Protection

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI
iv. Food Products: FSSAI
v. Electricity Supply: Electricity Regulatory Commission
vi. Real Estate Regulatory Authority

UNIT V **(15 Hours)**

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative

Product testing, Sustainable consumption and energy ratings. Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified.

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books :- www.consumereducation.in
8. Empowering Consumers e-book, www.consumeraffairs.nic.in
9. ebook, www.bis.org. The Consumer Protection Act, 1986 and its later versions.

UBC-33

18UBC404

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC404		Core Paper 4 – INTERMEDIARY METABOLISM		
Batch 2018-2019	Semester IV	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To learn the fate of dietary carbohydrates, proteins and lipids.

2. To study the various catabolic and biosynthetic pathways of biomolecules and their significance.

3. To understand the interrelationship between carbohydrate, protein and fat metabolism.

Course Outcomes (CO)

K1	CO1	Understand the various metabolic pathways of carbohydrate, proteins, fat and nucleic acid metabolism
K2	CO2	Remember the glycolysis, TCA cycle, Glycogenesis, glycogenolysis, β-oxidation, phospholipid biosynthesis, Urea cycle, Nucelic acid biosynthetic pathway and degradation of purine and pyrimidine
K3	CO3	Assessment of Bioenergetics of various metabolism pathways, role of inhibitors and uncouplers in electron transport chain
K4	CO4	Analysis of regulation of various metabolic pathways and their significance

Total Hours :60

UNIT I (12 Hrs)

Overview of metabolism: Definition; types of metabolic pathways. Fate of absorbed carbohydrates. Glycolysis: definition; significance; pathway; energy yield from glycolysis; regulation of glycolysis. Cori's cycle. Metabolic fate of pyruvate.

18UBC404

TCA Cycle: - reactions of the cycle; bioenergetics; amphibolic pathway; anaplerotic role of TCA cycle.

Pathway of glycogenesis and glycogenolysis; gluconeogenesis: definition; significance; pathway; substrates for gluconeogenesis; regulation of gluconeogenesis.

UNIT II (12 Hrs)

Biological oxidation: Introduction, high energy compounds, redox potentials; electron transport chain: overview; mitochondrial organization; structural organization of respiratory chain; oxidative phosphorylation; mechanism of oxidative phosphorylation–chemiosmotic hypothesis. Uncouplers of oxidative phosphorylation. Transport of reducing equivalents – glycerol-phosphate shuttle and malate – aspartate shuttle.

UNIT III (12 Hrs)

Blood lipids and fate of dietary lipids. Oxidation of fatty acids: Carnitine cycle; Beta – oxidation, alpha oxidation and omega oxidation.

Biosynthesis of saturated fatty acids: Extra mitochondrial and microsomal system for synthesis of fatty acids. Interconversion of fatty acids.

Biosynthesis and degradation: Lecithin, cephalin, phosphatidyl inositol and phosphatidyl serine. Plasma lipo proteins (Composition).

Biosynthesis of glycolipids.*

UNIT IV (12 Hrs)

Amino acid pool, overview of amino acid metabolism –deamination (oxidative and non- oxidative), transamination, decarboxylation. Urea cycle. Metabolism of individual amino acids – glycine, phenyl alanine and tyrosine.

UNIT V (12 Hrs)

Interrelationship between carbohydrate, fat and protein metabolism.

Metabolism of purines: *de novo*synthesis, salvage pathway, catabolism and regulation. Metabolism of pyrimidines: *de novo* synthesis, salvage pathway, catabolism and regulation. Conversion of ribonucleic acid to deoxyribonucleic acid, allopurinol. Biological significance of uric acid and β-aminoisobutyrate.

18UBC404

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Deb, A.C. (2011), Fundamentals of Biochemistry, 10th ed., New Central Book Agency Pvt. Ltd., Kolkata 700 009.
2. Satyanarayana, U.and Chakrapani, U. (2013) Biochemistry, 4thed., Books and Allied Pvt. Ltd, Kolkata, 700 010.

Reference Books:

1. Robert K. Murray, Daryl K. Granner and Victor W. Rodwell(2008), Harper's Illustrated Biochemistry, 29thed, McGraw Hill Companies, Inc. New Delhi.
2. Vasudevan D.M., Sreekumari S. and Kannan Vaidyanathan (2011), Text Book of Biochemistry for Medical Students, 6th ed., JAYPEE Brothers Medical Publishers Pvt. Ltd., New Delhi, 110002.
3. Moran, Horton, Scrimgeour, Perry & Rawn (2013), Principles of Biochemistry, 5th edition. Pearson New International Edition, UK.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	H
CO2	H	S	S	H	S
CO3	S	S	S	H	S
CO4	S	S	S	S	S

S – Strong H – High M – Medium L – Low

UBC-36

18UBC4S2

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC4S2		Skill Based Subject II - COMMON HUMAN DISEASES		
Batch 2018-2019	Semester III	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To provide a broad overview of the most common and important human diseases
2. To provide sufficient knowledge about the pathogenesis of common human diseases
3. To address the aspects of diseases, diagnosis and treatment essential to maintain human health

Course Outcomes (CO)

K1	CO1	Recollect the structure and functions of various biological systems.
K2	CO2	Understand the diseases of circulatory, endocrine and hepatic system.
K3	CO3	Describe and understand the pathophysiology of diseases.
K4	CO4	Acquire knowledge about the diseases, diagnosis and treatment essential to maintain human health.

Total Hours :30

UNIT I (6 hrs)

Diseases of Circulatory System –Hypertension and hypotension:- Definition of normo, hypo and hypertension, types, causes, pathogenesis, symptoms and treatments.

UNIT II (6 hrs)

Diseases of Endocrine System - Diabetes mellitus: Definition, normal range of fasting, random and postprandial blood sugar levels, different types of DM**,** causes of DM, and GTT.

UNIT III (6 hrs)

18UBC4S2

Diseases of Hepatic System - Formation and fate of bilirubin, normal value of plasma bilirubin, test for bilirubin – Van den Bergh test. Jaundice – definition, classification of jaundice – hemolytic jaundice, hepatic jaundice and obstructive jaundice.

UNIT IV (6 hrs)

Diseases of Obstructive Pulmonary System –Normal structure and functions of lungs*. Asthma – Definition, types – extrinsic (allergic and atopic), intrinsic (idiosyncratic and non – atopic) and mixed type. Common features of asthma, contrasting features of extrinsic and intrinsic asthma.

UNIT V (6 hrs)

Diseases of renal system– Clinical features and treatment of acute glomerulo nephritis and nephrotic syndrome. Urinary and renal calculi.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7th ed., Published by the Author, Chennai – 600 035.

2. Deb.A.C. (2011), Fundamentals of Biochemistry, 10th ed., New Central Book Agency Pvt. Ltd., Kolkata 700 009.

Reference Books:

1. Harish Mohan (2010), Text Book of Pathology, 6th ed., JAYPEE Brothers Medical Publishers P Ltd, New Delhi, 110 002.

2. Robbins and Cotran, (2010), Pathological Basis of Diseases, 8th ed., Elsevier, New Delhi, 110 019.

**Questions may also be taken from the self study portion*

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18UBC4S2

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	H
CO2	S	S	S	S	S
CO3	S	S	H	S	H
CO4	H	H	S	S	H

S – Strong **H** – High **M** – Medium **L** – Low

UBC-39

18UBC505

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC505		Core Paper 5 – HUMAN PHYSIOLOGY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the basic principles and mechanisms involved during the functioning of various organs of the physiological system.

2. To learn the mechanism of action of hormones, and their role under normal and abnormal conditions of the physiological system.

Course Outcomes (CO)

K1	CO1	Recall of the structure of skeletal muscle, GI tract, lungs, nephrons, neurons and reproductive system
K2	CO2	Understanding the mechanism of muscle contraction,mechanism of buffer action,transport of gases between tissues and blood,formation of urine, propagation of nerve application ,mechanism of action of hormones.
K3	CO3	Explanation of sources of energy for muscle contraction, functions of hormones, spermatogenesis, ovarian cycle, chemical changes during muscle contraction.
K4	CO4	Synaptic transmission of neuro-muscular transmission,pathophysiology of hormones of pituitary,thyroid,parathyroid and adrenal glands.

UBC-40

18UBC505

Total Hours :60

UNIT I (12 Hrs)

Skeletal Muscle

Skeletal muscle- General structure and sarcomere unit.Stucture of myosin, actin and regulatory proteins (tropomyosin and troponin). Mechanism of muscle fibre contraction. Chemical changes during muscle contraction. Sources of energy for muscle contraction.

Blood and body fluids

Blood - Composition and functions of blood*, blood grouping and blood transfusion, blood coagulation. Role of the anticoagulant- heparin in treatment. Ionic composition of ECF and ICF. Buffers of body fluids. Mechanism of action of bicarbonate and phosphate buffer systems. Formation and functions of lymph.

UNIT II

(12 Hrs)

Digestive System

Structure of GI tract. Secretion of digestive juices- composition and functions of saliva, gastric juice, pancreatic juice, bile and secretion of small intestine (succus entericus). Digestion and absorption of carbohydrates, Digestion and absorption of proteins. Digestion and absorption of fats.

Respiratory System

Structure of lungs. Diffusion of gases in lungs. Transport of oxygen from lungs to tissues through blood and factors influencing the transport of oxygen. Transport of CO_2 from tissues to lungs through blood and factors influencing the transport of CO_2.

UNIT III (12 Hrs)

Excretory System

Structure of kidneys. Structure of nephron. Mechanism of formation of urine, micturition and renal regulation of acid- base balance.Physical properties and composition of urine. Role of renin in renin-angiotensin-aldosterone system (RAAS).

18UBC505

Nervous system

Structure of neuron. Resting potential and Action potential. Propagation of nerve impulse. Structure of synapses. Synaptic transmission (electrical and chemical theory). Structure of neuromuscular junction. Mechanism of neuro muscular transmission.

UNIT IV (12 Hrs)

Endocrine System

Classification of hormones. Mechanism of action of hormones – intracellular receptor mechanism and second messenger mechanism (cAMP only).Structure and functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas (insulin and glucagon). Pathophysiology of hormones of pituitary, thyroid, parathyroid and adrenal glands.

UNIT V (12 Hrs)

Male Reproductive System

Structure of male reproductive system and spermatogenesis. Structure and functions of testosterone.

Female Reproductive System

Structure of female reproductive system. Ovarian cycle. Menstrual cycle. Menopause. Pregnancy and lactation. Structure and functions of oestrogens and progesterone.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Book

Saradha Subramaniam, Madavan kutty K. and Singh H. D. (2012).Textbook of Human Physiology. 6th edition., S. Chand and company LTD. New Delhi.

Reference Books

1. Chatterjee. M.N. and Rana Shinde (2005). A Text book of Medical Biochemistry. Jaypee Brothers Medical Publishers Pvt. Ltd, Delhi.

2. Chatterjee. C.C. (2004). Human Physiology (Vol I & II) 11th ed., MedicalAllied Agencies, Kolkata.

3. Robert K. Murray., Granner D.K., Mayes P.A. and Rodwell V.W., (2008).Harpers Illustrated Biochemistry, 27thed., Appleton and Lange Stanford, Connecticut, USA.

4. Talwar G.P. (2004), A Text book of Biochemistry and Human Biology, 3rd edition. Printice Hall of India Pvt Ltd, New Delhi.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-43

18UBC506

Programme Code: 07		Biochemistry		
Course Code: 18UBC506		Core Paper 6 – CELL BIOLOGY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Appreciates and understands the dynamic nature of the cell, including how it occurs and response to the information from its environment.
K2	CO2	Remembers the different mechanism of receptor activation and regulation.
K3	CO3	Explores the role of growth hormones in the biological system
K4	CO4	Predict how alterations or given drugs or chemical treatment would impact cell behavior

Total Hours :60

UNIT I (12 Hrs)

Cell membrane **–** Introduction to cell and its organelles, cell theory, comparison between plant and animal cell.

Fluid Mosaic Model: Biochemical composition (membrane carbohydrates, membrane proteins and membrane lipids) and functions. Membrane transport: Passive transport – simple diffusion and facilitated

diffusion, Active transport – simple active transport and specific transporters- antiport and symport, bulk transport- phagocytosis and endocytosis.

UNIT II (12 Hrs)

Protein Sorting and Transport: The endoplasmic reticulum: Protein secretion, Targeting proteins to ER, Protein folding and processing. Smooth ER and posttranslational modification.

Ribosomes: Organization, types and function.

Golgi apparatus: Organization, protein glycosylation and transportation of proteins.

Lysosomes: Acid hydrolases,endocytosis and lysosome formation. Autophagy and phagocytosis

UNIT III (12 Hrs)

Cytoskeleton: Chemistry, Organisation and function of Microtubules, Microfilaments and Intermediate filaments.

The nucleus: Structure of nuclear envelope; nuclear pore complex; Nucleolus: rRNA genes – transcription and processing of rRNA.

Cell division: mitosis and meiosis*.

UNIT IV (12 Hrs)

Cell signalling: Modes of cell – cell signalling, steroid hormones and nuclear receptor super family, nitric oxide, neurotransmitters, peptide hormones and growth factors. Functions of surface receptors: G protein - coupled receptors. Pathways of intracellular signal transduction: The cAMP, cGMP, phospholipids and calcium ion pathways.

UNIT V (12 Hrs)

Cell cycle: Overview of cell cycle and its control. Cell cycle control in mammalian cells, checkpoints in cell cycle regulation.

Apoptosis-pathways, regulators and effectors in apoptosis.

Cancer: Types, properties, causes and development. Tumor viruses - DNA and RNA viruses.

Tumor suppressor genes and functions of their products. Carcinogenic effect of chemicals and radiation.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

18UBC506

Text Books:

1. Cooper .G. M. (2009), The Cell: A Molecular Approach, 5th ed., Boston university, ARM press, Washington D.C.,USA

2. Verma.P.S. and Agarwal.V.K. (2014), Cell Biology, Genetics, Molecular biology, Evolution and Ecology, S. Chand and Company, New Delhi.

Reference Books:

1. Harvey Lodish, Baltimore David, Arnold Berk *et al*., (2007), Molecular Cell Biology, 6th ed., Scientific American Books, USA.

2. Garrette R.H and Grisham, C. M (2012), Principles of Biochemistry, 5th ed, Saunders college publishers, US.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	S	S	H	S	S
CO3	S	H	H	H	S
CO4	H	H	S	S	H

S – Strong **H** – High **M** – Medium **L** – Low

UBC-46

18UBC507

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC507		Core Paper 7- CLINICAL BIOCHEMISTRY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a conceptual background in Clinical Biochemistry

2. To provide students with an understanding of various types of diseases and their causes, symptoms, prevention, management and treatment

Course Outcomes (CO)

K1	CO1	Recall the metabolism of carbohydrates, lipids and proteins
K2	CO2	Describe the disorders of carbohydrate, lipids, protein and amino acids metabolism & assess the gastric, intestinal, liver and kidney functions
K3	CO3	Demonstrate the types, clinical pathology and diagnosis of disorders of carbohydrate, lipids, protein and amino acids
K4	CO4	Analyze the blood and serum samples for the diagnosis and prognosis of diseases

Total Hours :60

UNIT I (12 hrs)

Disorders of carbohydrate metabolism:

Normal glucose level in blood*, renal threshold value.

Hypoglycemia: Definition and causes of hypoglycemia.

Hyperglycemia: Definition and causes of hyperglycemia.

Diabetes mellitus: Introduction, types of diabetes mellitus; clinical pathology and diagnosis.

Glycosylated haemoglobin.

UNIT II (12 hrs)

Disorders of lipid metabolism:

18UBC507

Plasma lipids and lipo proteins – Introduction; hyper lipoproteinemia. Type I, II, III, IV and V and alpha lipoproteinemia.

Hypolipoproteinemia: α-β – lipoproteinemia, hypobetalipoproteinemia, Tangier's disease and lecithin – cholesterol acyl-transferase deficiency.

UNIT III (12 hrs)

Plasma protein abnormalities.

Hypoplasma proteinuria and hyper plasma proteinuria

Disorders of amino acid metabolism: Cystinuria, phenylketoneuria and maple syrup diseases.

Definition and causes of hypo and hyper uremia. Definition and causes of hypo and hyper uricemia.

UNIT IV (12 hrs)

Gastric and Intestinal functional tests:

Gastric functional tests – Introduction, tests of gastric function – The insulin stimulation test and tubeless gastric analysis.

Intestinal functional tests – Introduction, tests used in the diagnosis of malabsorption – determination of total faecal fat (fat balance test), test of monosaccharide absorption (xylose excretion test) and determination of total protein (Lowry's method).Pancreatic function test.

UNIT V (12 hrs)

Liver and Kidney function tests. Liver function tests, estimation of conjugated and total bilirubin in serum (diazo method), detection of bilirubin and bile salts in urine (Fouchet's test and Hay's sulphur test) and marker enzymes: SGOT, SGPT, γ-glutamyltransferase.

Kidney function test: Urea clearance test, creatine clearance test and GFR.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books

1. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7th ed.,Published by the Author, Chennai – 600 035.
2. Deb, A.C. (2011), Fundamentals of Biochemistry, 10th ed., New Central Book Agency Pvt. Ltd., Kolkata 700 009.

Reference Books

1. Carl A. Burtis, Edward R. Ashwood, Norbert W. Tietz. (2012). Tietz Textbook of Clinical Chemistry and molecular diagnostics. 5th ed, Saunders college publishing, Harcourt Brace College Publishers, Philadelphia, Newyork, Tokyo.
2. Vasudevan D.M, Sreekumari S and Kannan Vaidyanathan, (2011), Text Book of Biochemistry for Medical Students,6th ed., Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi, 110002.
3. Thomas M. Devlin (2010) Textbook of Biochemistry with Clinical Correlations, 7th Edition, john Wiley & Sons, Inc, US.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	H	S	M	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	H

S – Strong **H** – High **M** – Medium **L** – Low

UBC-49

18UBC508

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC508		Core Paper 8 – MOLECULAR BIOLOGY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the scientific process in the content of learning the fundamental biological and chemical factors of molecular biology.
2. To gain knowledge about DNA replication, DNA repair mechanism and mutation.
3. To understand the mechanism of transcription and reverse transcription.
4. To acquire the knowledge about gene regulation.

Course Outcomes (CO)

K1	CO1	Understand the dynamics of protein synthesis with respect to ribosome structure, function and accuracy of translation
K2	CO2	Remember the Genetic Code and the amino acid which it codes. the role of various enzymes and proteins in DNA replications, transcription and translation
K3	CO3	Advanced and integrated knowledge of the process that occur in DNA recombination and repair process
K4	CO4	Exploit spontaneous and chemically induced mutations

UBC-50

18UBC508

Total Hours :60

UNIT I (12 Hrs)

Organization of eukaryotic chromosome

Nucleosomes are the fundamental unit of chromatin, types and properties of histones. Chromatin assembly. DNA carries genetic information, Transformation, Transduction, Conjugation, Griffith's Experiment, Avery's Experiment and Hershey – Chase experiment.

UNIT II (12 Hrs)

DNA Replication

DNA Replication, semi conservative mechanism, The Meselson – Stahl experiment, enzymology of DNA replication, initiation, elongation and termination. DNA repair mechanism: excision repair, mismatch repair and SOS response. Mutation: spontaneous and induced mutation.

UNIT III (12 Hrs)

Transcription

Central Dogma,Synthesis of RNA, DNA dependent RNA Polymerase, sigma factor, association of RNA polymerase with DNA, initiation, elongation, termination of transcription, post transcriptional modification of RNA, reverse transcription*, RNA directed RNA polymerase.

UNIT IV (12 Hrs)

Translation:

Genetic Code: Features of genetic code, chemical composition of eukaryotic and prokaryotic ribosomes, activation of amino acids, initiation, elongation and termination of protein synthesis in prokaryotes, post translational modification of proteins and inhibitors of protein synthesis.

UNIT V (12 Hrs)

Gene Regulation:

Regulation of gene expression in E.coli: Types of operon: lactose and tryptophan (negative and positive control).Gene regulation in eukaryotes.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Ajoy Paul (2007),Text Book of Cell and Molecular Biology, Books and allied Pvt. Ltd. Kolkata.
2. G.P. Jayanthi (2009), Molecular Biology, MJP publishers, Chennai.

Reference Books:

1. Robert .H. Tamarin (2008), Principles of Genetics, 7th ed., Tata McGraw Hill Publishing Company Ltd, Kolkata.
2. Gardner and Simmons Snustad (2008), Principles of genetics, 7th ed., John Wiley & Sons Inc. USA.
3. David L. Nelson, Micheal M. Cox (2008), Lehninger's Principles of Biochemistry, Replika press (P) Ltd, India.
4. David Freifelder (2004). Molecular Biology . 5th edition. Jones & Bartlett Publishers.

**Questions may also be taken from the self study portion also*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	S	S
CO3	S	S	S	H	S
CO4	H	S	S	S	S

S – Strong H – High M – Medium L – Low

UBC-52

18UBC6CN

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6CN		C.Pr.3. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester V & VI	Hours / Week 4	Total Hours 120	Credits 3

Course Objectives

1. To make students learn the methods of collection of blood and urine samples and separation of serum

2. To analyze the biochemical parameters in urine and blood samples and indicate their clinical significance

3. To demonstrate the kit methods for the assay of biochemical parameters

Course Outcomes (CO)

K3	CO1	Apply various techniques for the assay of important biochemical parameters and interpret their values
K4	CO2	Calculate the values from the graph obtained in the experiment
K5	CO3	Estimate the level of bilirubin, SGOT, SGPT, LDH, CKMB in the given sample using kit method

Total Hours :120

List of programs

I. Quantitative estimation of the following in urine

1. Glucose - Benedicts method
2. Calcium - Permanganate method

II. Quantitative estimation of the following in the blood

1. Glucose - Glucose oxidase method.
2. Urea - DAM – TSC method.
3. Cholesterol - Zak's method
4. Phosphorus - Fiske and Subbarow method
5. Uric acid - Caraway Method
6. Iron and Haemoglobin - Wongs method
7. Total protein
8. AG ratio

III. Group Experiments (kit method)

1. Bilirubin – Direct and Indirect.
2. SGOT.
3. SGPT.
4. LDH
5. CKMB

Reference Books

1. N. Raghuramalu, K. Madhavan Nair and S. KalyanaSundaram (2003), A Manual of Laboratory Techniques, 2nd ed., NIH, Hyderabad.
2. S.P. Singh (2004), Practical Manual of Biochemistry, 5th ed., CBS Publishers and Distributors, New Delhi.
3. S.K. Shawney, and Randhirsingh, (2002), Introductory Practical Biochemistry, Narosa Publishing House. India.
4. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, New Delhi.

UBC-54

18UBC6CN

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	S
CO2	S	H	S	S	H
CO3	S	S	H	S	H
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-55

18UBC6CO

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6CO		**Title:** C.Pr.4. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester V & VI	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To isolate plasmid DNA and genomic DNA, isolation and restriction digestion of DNA through demonstration experiments
2. To perform simple staining, gram staining and negative staining, isolation of microbes and biochemical tests for identifying bacteria
3. To demonstrate media preparation, callus initiation in plant tissue and mitosis in onion root tips

Course Outcomes (CO)

K3	CO1	Employ molecular methods in isolation, restriction digestion and separation of DNA
K4	CO2	Analyze microbiological methods of staining, plating and biochemical tests for identifying them
K5	CO3	Familiarize the techniques of plant tissue culture and cell biology through demonstrations

Total Hours :30

List of programs

GENETIC TECHNOLOGY

a. Estimation of DNA by diphenylamine method

b. Estimation of RNA by orcinol method

c. Preparation of buccal smear

d. Separation of DNA by agarose gel electrophoresis (Demo)

e. Restriction digestion of DNA (Demo)

f. Isolation of Plasmid DNA from bacteria (Demo)

g. Isolation of Genomic DNA from liver/plant/bacterial source (Demo)

MICROBIOLOGY

a. Isolation of pure culture - serial dilution, pour plate, spread plate and streak plate.

b. Simple staining, Gram staining and Negative staining.

c. Biochemical tests for identification of Bacteria.

d. Isolation of microbes from samples – sewage/ water/ soil.

e. Antibiotic Sensitivity Test – Kirby Bauer Method

PLANT BIOTECHNOLOGY (Demonstration)

a. Preparation of media and sterilization.

b. Initiation of callus culture.

CELL BIOLOGY (Demonstration)

a. Animal cell types

b. Mitosis in onion root tips

Reference Books

1. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, New Delhi.
2. RamnikSood(2003), Medical Laboratory Technology, 5th ed., (reprint), Jaypee brothers, Medical Publishers Private Ltd, New Delhi.

3. Kannan. N. (2002), Laboratory Manual in General Microbiology, Panima publishing corporation, Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	M
CO2	S	S	S	H	H
CO3	H	S	H	S	H
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-58

18UBC6CP

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6CP		C.Pr.5. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester V & VI	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To estimate chlorophyll, starch, total phenols and qualitatively analyze various secondary metabolites in plant sample
2. To determine RA and pregnancy tests using kit method
3. To demonstrate RBC count, total and differential count of WBCs and identifying blood groups

Course Outcomes (CO)

K3	CO1	Practice techniques of different plant component isolation, antigen-antibody interactions in immunological kit methods and identifying blood groups
K4	CO2	Calculate the number of RBC and WBCs
K5	CO3	Estimate chlorophyll, starch and total phenols present in plant sample

Total Hours :30

List of programs

PLANT BIOCHEMISTRY

a. Qualitative Analysis of Secondary Metabolites - Alkaloids, Flavonoids, Saponins and Glycosides
b. Estimation of chlorophyll.
c. Estimation of starch.

d. Estimation of total phenols.

IMMUNOLOGY

a. RA factor (kit method)

b. Pregnancy test (kit method)

PHYSIOLOGY (Demonstration)

a. Identification of blood groups.

b. Enumeration of RBCs.

c. Enumeration of total WBCs.

d. Differential count of WBCs.

Reference Books

1. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New age International Publishers Ltd, New Delhi.
2. Kannan. N. (2002), Laboratory Manual in General Microbiology, Panima publishing corporation, Delhi.
3. RamnikSood (2003), Medical Laboratory Technology, 5th ed., (reprint), Jaypee brothers, Medical Publishers Private Ltd, New Delhi.

UBC-60

18UBC6CP

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	H
CO2	S	S	S	H	H
CO3	S	M	H	S	H
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-61

18UBC5X1

Programme Code: 07		For B.Sc Botany, Zoology & Biotechnology		
Course Code: 18UBC5X1		Extra Departmental Course - I - DIAGNOSTIC BIOCHEMISTRY		
Batch 2018-2019	Semester V	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To make the students to know the principles for routinely conducted tests in diagnostic laboratories.
2. To select the appropriate biochemical tests to the diagnosis of the diseases.
3. To enable the students to interpret the laboratory data properly.

Course Outcomes (CO)

K1	CO1	Remember the basic concepts of collection of samples
K2	CO2	Understand the idea about the tests performed using blood, serum and enzymes
K3	CO3	Familiarize with the clinical importance of hormones
K4	CO4	Analyze and execute the clinical laboratory techniques

Total Hours :30

UNIT I (6 hrs)

Introduction to Diagnostic Biochemistry. Components of blood - cellular and fluid components and their functions. Collection of blood specimens and separation of plasma and serum using anticoagulants (heparin, EDTA and sodium citrate).

UNIT II (6 hrs)

Haemotology – Introduction, haemoglobin- normal value and functions of haemoglobin. ESR, Significance of glycosylated hemoglobin. Blood grouping*.

UNIT III (6 hrs)

Serology**:** Introduction, importance and clinical significance of ELISA, Fluorescent antibodies, VDRL test, Widal Test, RA test, Pregnancy test and CRP test.

UNIT IV (6 hrs)

Enzymology**:** overview and diagnostic value of enzyme assays. Assay and clinical importance of Serum glutamate oxalo acetate transaminase, serum glutamate pyruvate transaminase, lactate dehydrogenase, creatine kinase, Acid phosphatase and alkaline phosphatase.

UNIT V (6 hrs)

Endocrinology**:** Introduction and clinical importance of hormone assay

Thyroid hormones: T3, T4 and TSH

Sex hormones**:** FSH, testosterone, progesterone and estrogen.

Biosafety measures and disposal of laboratory waste.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Pal G.K. and Pravati Pal (2010), Text Book of Practical Physiology, 3rd ed., Universities Press, Hyderabad, 500 029.

2. Gowenlock.A.H.; Janet R Mc Murray, Donaly M McLauchlan; (2002) Varley's Practical Clinical Biochemistry; 6thed.,Sathish Kumar Jain for CBS Publishers and Distributors, New Delhi.

Reference Books:

1. Thomas M Devlin, (2002), Text book of Biochemistry with Clinical Correlations, 5th ed., John Wiley and Sons, Inc. Publications. USA.

2. Harish Mohan (2010), Text Book of Pathology, 6th ed., JAYPEE Brothers Medical Publishers Pvt Ltd, New Delhi, 110 002.

UBC-63

18UBC5X1

**Questions may also be taken from the self study portion also*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	S	H	H
CO3	H	S	H	S	S
CO4	S	S	S	H	H

S – Strong **H** – High **M** – Medium **L** – Low

UBC-64

18UBC609

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC609		Core Paper 9 – PLANT BIOCHEMISTRY		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To deep understanding of metabolic processes in plants and role of various biosynthetic pathway.

2. To acquire knowledge about photosynthetic apparatus, role of nitrogen in plants.

3. To explore the plant growth regulators and their role and roles of secondary metabolites in plants.

Course Outcomes (CO)

K1	CO1	Recollect the structure and function of plant cell.
K2	CO2	Understand the mechanism of photosynthesis in plants.
K3	CO3	Execute the concept of role of minerals and growth hormones in plants.
K4	CO4	Analyze the nature and functions of secondary metabolites.

Total Hours :60

UNIT I (12 Hrs)

Introduction to plant cell structure*.

Photosynthesis**:** Overview, Pigments – chlorophylls, carotenoids and phycobillins. Photosynthetic apparatus. Photo system I and II – Mechanism of Photosynthesis- cyclic and non cyclic photophosphorylation. Light reactions –Red drop and Emerson's enhancement effect, Hill's reaction, Arnons work. Dark reactions: C3, C4 and CAM pathway

UNIT II (12 Hrs)

Role of nitrogen in plants. Nitrate reduction. Nitrogen cycle, Nitrogen fixation: non-biological, biological- symbiotic, non-symbiotic and associative. Biochemistry of nitrogen fixation and factors Mineral nutrition in plants: Major elements: Nitrogen, Phosphorus, Sulphur, Calcium, Magnesium and Potassium-specific roles and deficiency symptoms in plants.

Minor elements: Iron, manganese, copper, zinc, boron, molybdenum, chlorine and nickel- specific roles and deficiency symptoms in plants controlling biological nitrogen fixation.

UNIT III (12 Hrs)

Plant growth regulators: Chemistry, biosynthesis, physiological effects, applications of auxins, gibberellins, cytokinins, abscisic acid and ethylene.

Vitamins in plants**:** occurrence and biological functions.

UNIT IV (12 Hrs)

Photo morphogenesis: Photo periodism. Phytochrome - Function in growth and development of Plant. Biochemistry of seed germination. Biochemistry of fruit ripening. Seed storage proteins in legumes and cereals.

UNIT V (12 Hrs)

Secondary metabolites: Classification, Biosynthetic pathways (structures not needed) and biological functions of terpenes, alkaloids, cyanogenic glycosides, phenolics, flavonoids (anthocyanins) and tannins.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Jain. V. K. (2013)., Fundamentals of Plant physiology, 17th ed., S. Chand and Company Ltd, New Delhi, India.

2. Verma. P. K. (2005)., Text Book of Plant Physiology, 8th ed., EMKAY Publications, Bhopal.

Reference Books:

1. Buchanan. B. B, Gruissem. W., Jones. R. (2015), Biochemistry and molecular biology of plants, 2nd edition, Wiley Blackwell publishers, USA.

2. Hopkins .W. G.(2008), Introduction to Plant Physiology, 2nd ed., John Wiley and sons Publishers, UK.

3. Heldt. H. W. (2005). Plant Biochemistry, 3rd edition. Academic Press, USA.

**Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	S	H	H
CO3	S	S	H	S	S
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-67

18UBC610

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC610		Core Paper 10 – IMMUNOLOGY AND IMMUNOTECHNIQUES		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To learn about the basic principles of immunology, functioning of immune system, immunological techniques of clinical and research laboratories.

2. To know about the different types of immune mechanisms involving in various abnormal and diseased conditions.

Course Outcomes (CO)

K1	CO1	Learning the basics of immunity and immune system,formation of cytokinins, different features of antigens and antibodies.
K2	CO2	Understanding of the mechanism of antibody and cell mediated immunity,action of complement system.
K3	CO3	Learning the development of various clinical conditions during thevarious abnormal conditions.
K4	CO4	Application of antigen – antibody reactions in the diagnosis of various infectious diseases using different techniques.

UBC-68

18UBC610

Total Hours:60

UNIT I (12 Hrs)

Immunity- Definition and types. Innate immunity- Definition; Physical, biochemical,cellular and genetic factors. Acquired immunity - active and passive .Child Immunization chart*. Cells of the immune system- B and T lymphocytes , Natural Killer cells , Macrophages, Antigen presenting cells, Eosinophils, Neutrophils and Mast cells. Lymphoid organs – Primary (Thymus,Bursa of Fabricius and Bone marrow) and Secondary lymphoid organs(Spleen , Lymph node and MALT).

UNIT II (12 Hrs)

Antibody mediated immunity – Definition ; Maturation of B – lymphocytes; Activation of B - lymphocytes by antigens and production of antibodies. Primary and secondary immune responses. Cell mediated immunity – Definition; Maturation and types of T-lymphocytes; Activation of T_H cells; Cytokines–definition and types. Functions (any two) of Inter leukins (IL-1,IL-2,IL-4,IL-12), Interferons(IFNs), Tumour necrosis factor(TNFs),Colony stimulating factors (CSFs). Cytotoxic activity of Tc, NK and K cells.

UNIT III (12 Hrs)

Antigens– Definition, Characteristic features of antigens, Cross reactivity, Haptens and adjuvants. MHC (Major Histocompatability Complex) - Definition with examples (HLA and H-2).

MHC antigens – Definition and Classification (structures not required).

Antibodies – Definition. Structure of Immunoglobulin **(**with reference to IgG**);** Classification of immunoglobulins; Properties and biological functions of immunoglobulins (IgG, IgM, IgA, IgD and IgE);

Complement system – Definition and components of complement system; Classical complement pathway, alternate pathway. Phagocytosis and Inflammation.

UNIT IV (12 Hrs)

Hypersensitivity – Definition, types, clinical manisfestation: Type I, II, III and IV and their clinical manifestations. Autoimmune diseases – Definition; Myasthenia gravis and Rheumatoid arthritis.

Transplantation – Definition and classification. Mechanism and complications of allograft rejection. AIDS **–**Definition**.** AIDS virus – structure. Mechanism of action of AIDS virus on T-cells, Development of disease and Clinical symptoms.

UNIT V (12 Hrs)

Antigen antibody interactions –formation of precipitation and agglutination- precipitin curve test. Immunotechniques–Immunodiffusion: Double diffusion in two dimensions (Ouchterlony procedure). Immunoelectrophoresis, Fluorescent antibody technique, RIA, ELISA, Western blotting technique.

Teaching Methods

Chalk and Board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books

Ananthnarayanan. R and Jayaraman Panikar C.K. (2009). Text book of Microbiology, 8th edition., Orient Longman Ltd, Madras.

Reference Books

4. David Male, Jonathan Brastoff, Roitt Ivan and David Roth (2012). Immunology, 8thed., Times mirror,International Gower Medical Publishing Ltd, printed by Grajos SA, Arts Sobrepapel, Barcelona, Spain.
5. Judy Owen, Jenni Punt and Sharon Stranford (2012), Kuby Immunology,7thed., W.H.Freeman Company, USA.
6. Ian R.Tizard (2000), Immunology - An Introduction, 4th edition. Saunders college publishing, Harcourt Brace College Publishers, Philadelphia, Newyork, Tokyo.

**Questions may also be taken from the self study portion*

UBC-70

18UBC610

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	M	M	H	H
CO2	S	S	S	S	S
CO3	H	M	H	H	H
CO4	S	S	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-71

18UBC611

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC611		Core Paper 11 – GENETIC TECHNOLOGY		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a broad conceptual background in the field of genetic engineering

2. To describe the methods used to create recombinant DNA molecules and introduce them into prokaryotic cells

3. To expose the students to the application of genetic engineering in medicine and agriculture

Course Outcomes (CO)

K1	CO1	Recognize the concept of recombinant DNA technology or genetic engineering
K2	CO2	Describe a range of techniques in gene manipulation, the cloning vectors available and the containment procedures
K3	CO3	Demonstrate the application of transgenic plants with herbicide resistance, virus resistance, pest resistance and male infertility and the production of recombinant insulin
K4	CO4	Examine the difficulties during the expression of eukaryotic DNA in prokaryotes and how to overcome these difficulties

UBC-72

18UBC611

Total Hours :60

UNIT I (12 hrs)

Gene cloning- introduction, basic steps in gene cloning; methods to generate desired foreign genes- isolation of prokaryotic gene by restriction enzyme, isolation of eukaryotic gene by DNA synthesis. Joining DNA molecules: ligases, linkers and homopolymers. Cloning vectors- characteristics of an ideal vector molecule: natural vectors- *E.coli* plasmids; *invitro* vectors – pBR322; λ-phage; single stranded vector- M13.

UNIT II (12 hrs)

Introduction of rDNA into bacterial cells: Transformation of E.coli ; selection and screening of recombinants. Genomic library and cDNA library. Southern, northern and western blotting techniques.

UNIT III (12 hrs)

DNA sequencing: Outline of Sanger's method. Genetic finger printing – technique and applications.*In vitro* mutagenesis: site directed mutagenesis, protein engineering.

Basic PCR – Technique and applications;

UNIT IV (12 hrs)

Expression vectors of E. coli: Constituents; examples of promoters – expression cassettes – problems caused in expression of eukaryotic genes; fusion proteins. Production of recombinant insulin. Safety aspects and hazards of genetic engineering*, HGP: objectives and applications.

UNIT V (12 hrs)

Gene transfer in plants: Ti plasmid vectors; mechanism of T-DNA transfer, virulence genes, electrofusion, biolistics process. Applications of transgenic plants – herbicide resistance, male infertility, virus resistance, pest resistance, antisense RNA.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. R. Twyman, B. Old and S. B. Primrose (2001). Principles of Gene Manipulation: An Introduction to Genetic Engineering, 6th ed., John Wiley and sons Publishers, UK.

2. Satyanarayana, U. (2007), Biotechnology, Books and Allied (P) Ltd, Kolkata, 700 010.

3. Kumaresan , K (2010). Biotechnology, revised edition, SARAS publication, Kanniyakumari, India.

Reference Books:

1. T.A. Brown (2015), Gene Cloning and DNA analysis, 7th ed., Blackwell publishing Ltd, UK.

2. Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten (2010). Molecular Biotechnology:Principles and Applications of Recombinant DNA, 4th ed., ASM Press, USA.

**Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	S
CO2	S	H	S	S	H
CO3	S	S	H	S	H
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-74

18UBC6S4

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6S4		Skill based subject 4– TECHNIQUES IN GENOMICS AND PROTEOMICS		
Batch 2018-2019	Semester VI	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Recollect the organization of the nuclear DNA and mapping
K2	CO2	Get thorough knowledge about human genome project and sequencing
K3	CO3	Update the knowledge about transcriptomics
K4	CO4	Analyze the applications of proteomics in various diseases

Total Hours :30

UNIT I (12 Hrs)

Genome: Definition, Organization of nuclear DNA and mitochondrial DNA in eukaryotes. Telomeres, Centromeres* and Transposons. RFLP and RAPD. BAC libraries and cDNA libraries**.** Mapping genome-molecular markers, cytogenetic maps, physical maps.

UNIT II (12 Hrs)

Sequencing techniques : High throughput sequencing and shotgun sequencing. PCR and RT-PCR. Complementery DNA (cDNA). Human Genome Project (HGP) - features. Positional cloning. Identifying disease genes and Gene therapy

UNIT III (12 Hrs)

Comparitive genomics – Definiton and its importance. Ortholog and Paralog. Comparitive genomics of model organisms- bacteria, *C.elegans* and Drosophila.

UNIT IV (12 Hrs)

Transcriptomics-Definition and applications. Messenger RNA (mRNA) in the cell. Northern blot. Expression profiling – Introduction. DNA microarray analysis and RNA – Seq analysis. Pharmocogenomics.-Introduction and applications. Drug designing and Genetic tests.

UNIT V (12 Hrs)

Proteomics- Definition, structural genomics-MALDI-ToF Mass spectrometry (MS), PFGE. Functional genomics: 2D gel electrophoresis. Protein microarray. Peptide finger printing.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Brown T.A. (2015). Gene Cloning and DNA analysis, 7th ed., Blackwell publishing Ltd, UK.
2. Primrose S.B and Twyman (2006).Principles of Gene Manipulation and Genomics. 7th ed., Blackwell Publishing, USA.

Reference Books:

1. Stracham.T and Read.A.P.(2004), Principles of Human molecular genetics, 3rd edition. Garland Science Publication, New York.
2. Clark. D. P. and Pazdernik.N. J (2009). Biotechnology applying the Genetic revolution, Elseiver Academic Press, USA.

* *Questions may also be taken from the self study portion*

UBC-76

18UBC6S4

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	S	H	S	H	S
CO3	S	S	S	S	H
CO4	H	S	S	S	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-77

Programme Code: 07	B.Sc Biochemistry		
Major Elective – MICROBIOLOGY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To provide students with a conceptual background in microbiology
2. To provide students with an understanding of various microbiological techniques
3. To make the students to be familiar with the relationship between microbes and human beings

Course Outcomes (CO)

K1	CO1	Recall the characteristics of bacteria, algae, fungi and viruses
K2	CO2	Describe the role of microbes as normal flora and as disease causing agents
K3	CO3	Demonstrate the microscopic techniques, staining and culturing methods
K4	CO4	Analyze the bacteriological examination and purification of drinking water

Total Hours: 60

UNIT I (12 hrs)

Introduction to microbiology, Microscopy – Bright field microscopy, fluorescent microscopy, electron microscopy- transmission electron microscopy, scanning electron microscopy.
Culture techniques for isolation of bacteria- streak plate technique, pour plate technique.
Staining – Simple staining, flagella staining, gram staining, acid-fast staining.

UNIT II (12 hrs)

Prokaryotes: Morphology of bacteria, component parts, cell wall structure, growth curve, media composition**.**

Eukaryotes: Morphology, characteristics and importance of algae and fungi.

UNIT III (12 hrs)

Viruses: Cultivation of viruses using fertilized eggs and animal cell culture, structure of viruses, plaque assay.

Bacteriophages – T_4 phage, stages in life cycle; Lambda phage-life cycle; switch between lysogeny and lytic cycle.

Oncogenic viruses – oncogenic DNA viruses- SV40; oncogenic RNA viruses-HIV.

UNIT IV (12 hrs)

Microbial diseases: Normal human micro flora, host parasitic interaction, exo and endotoxins.

Water borne diseases – Aetiology, pathogenesis and symptoms of cholera and dysentery.

Air-borne diseases – Aetiology, causes, symptoms and prevention of TB and diptheria.

Direct contact disease – Aetiology and symptoms of rabies*.

UNIT V (12 hrs)

Water microbiology: Microbes in water; bacteriological examination of water; purification of drinking water. Soil microbiology**:** Rhizosphere and mycorrhiza.

Microbiology of food borne diseases: Botulism, staphylococcal poisoning, salmonellosis and perfringens poisoning.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Micheal J. Pelczar, E.C.S. Chan and Noel R. Krieg (2008), Microbiology 5th ed., Tata McGraw - Hill Publishing Company Ltd, New Delhi.
2. R.C. Dubey and D.K. Maheshwari (2005), Text Book of Microbiology, S Chand and Company Ltd. New Delhi.

Reference Books:

1. Geetha Sumbali and R.S. Mehrotta (2009), Principles of Microbiology, Tata McGraw – Hill Education private limited, New Delhi.
2. Joanne Willey,Linda Sherwood, Christopher J. Woolverton (2016), Prescott's Microbiology 10th ed., McGraw-Hill Education, Chennai, Tamilnadu.

UBC-79

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	H	S	M	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	H

S – Strong **H** – High **M** – Medium **L** – Low

UBC-80

Programme Code: 07	B.Sc Biochemistry		
Major Elective – Biotechnology			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To provide knowledge about plant tissue culture and animal tissue culture.
2. To acquire knowledge about various methods of genetic engineering of animal cells.
3. To provide knowledge about gene therapy and *in vitro* fertilization.
4. To know about the different fermentation technologies.

Course Outcomes (CO)

K1	CO1	Understand plant and animal tissue culture technique, Gene therapy, Fermentation technology and Bioremediation
K2	CO2	Remember various media used for tissue culture, types of cultures used in Fermentation technology and Bioremediation
K3	CO4	Implication of genetically modified plants, *invitro* fertilization recombinant vaccines and Downstream process
K4	CO3	Evaluate the merits and demerits of plant and animal tissue culture, Ex-vivo and *invivo* gene therapy

Total Hours: 60

UNIT I (12 Hrs)

Plant Biotechnology

Plant tissue culture media: composition, types and constituents. Applications of plant tissue culture. Plant tissue culture technique. Callus culture, suspension culture, protoplast culture (isolation,

culture and regeneration). Somatic hybridization technique and its applications. Micropropagation: technique, applications and demerits. Production and implications of genetically modified cotton and brinjal.

UNIT II (12 Hrs)

Animal Biotechnology

Animal cell culture: basic requirements and applications.

Animal cell culture media: physicochemical properties. Development, advantages and disadvantages of serum free media.

Characteristicsof cultured cells: cell adhesion, cell proliferation, cell differentiation,metabolism, initiation of cell culture, evolution and development of cell lines, characterization, identification of a specific cell line. Growth cycle of cultured cells. Primary cell culture technique. Artificial insemination and embryo transfer; *invitro* fertilization; transgenic mice.

UNIT III (12 Hrs)

Medical Biotechnology

Gene therapy: *exvivo* and *invivo.* Antisense therapy for cancer and AIDS. Recombinant vaccines. Aptamers as therapeutic agents. DNA in disease diagnosis – tuberculosis, AIDS, cancer, cystic fibrosis, sickle cell anaemia.

UNIT IV (12 Hrs)

Bioprocess Technology

Bioreactors: types, operation of conventional bioreactor, solid substrate fermentation, media for industrial fermentation, sterilization of culture media and gases, types of culture, stages of fermentation. Stages of Downstream processing. Production of Single cell protein, antibiotic (penicillin) and citric acid.

UNIT V (12 Hrs)

Environmental Biotechnology

Biodegradation: Introduction, Biodegradation of hydrocarbons.

Bioremediation: Types and reactions of bioremediation, GEMs in bioremediation, bioremediation of soil and waste lands. Biohazards and safety aspects*. Ethical, legal and social implications of biotechnology. Patenting biotechnology inventions.

Teaching Methods

Chalk and board / Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. U. Sathyanarayana (2013), Biotechnology, Books and Allied (P) Ltd, Kolkata.
2. V. Kumerasan (2010), Biotechnology, 6th ed., Saras Publication, Nagerkoil.
3. Butterworth-Heinemann, 2004, *In vitro* Cultivation of Animal Cells, 1st ed., published by the author, UK.

Reference Books:

1. R. Ian Freshney (2005), Animal cell culture; IRL press, UK.
2. Benjamin Lewin (2008), Genes IX , Jones and Barlet Publishers, USA.
3. Biotechnology (2013). Dubey. S. Chand & Company Pvt. Ltd.
4. Adrian Slater, Nigel W Scott, Mark R Fowler (2010). Plant Biotechnology : The genetic manipulation of plants. 2nd ed., Oxford University Press. New York.

** Questions may also be taken from the self study portion also*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	S
CO2	S	H	S	S	S
CO3	S	S	S	H	S
CO4	H	S	H	H	S

S – Strong H – High M – Medium L – Low

UBC-83

Programme Code: 07	B.Sc Biochemistry		
Major elective -ADVANCED CLINICAL BIOCHEMISTRY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To make the students learn more about the latest techniques in clinical laboratories for diagnosis of different types of diseases.
2. To understanding the abnormal levels of various biochemical parameters in diseased conditions.

Course Outcomes (CO)

K1	CO1	Practice the collection of blood using apparatus
K2	CO2	Understand the clinical significance of abnormal constituents of urine
K3	CO3	Analyze the clinical causes of haemoglobin related diseases
K4	CO4	Evaluate the liver tests using automated instruments

Total Hours: 60

UNIT I (12 Hrs)

Collection of blood specimens-vein puncture, vein occlusion, collection using syringe*, evacuated tube, capillary blood, venous blood and arterial blood. Changes in blood on keeping. C-reactive protein, ESR protein precipitants and anticoagulants.

UNIT II (12 Hrs)

Collection of urine specimens-urine preservatives, normal composition and minerals in urine. Changes on keeping. Automated instruments in analysis. Test and clinical significance of abnormal constituents in urine(sugar, protein, ketone bodies blood bile salts and bile pigments).

UNIT III (12 Hrs)

Hb occurrence in cells, plasma and urine. Normal Hb. Abnormal Hb- Haemoglobinemia and hemoglobinuria. Sickle cell anemia and hemophilia. Separation and identification of abnormal Hb.

UNIT IV (12 Hrs)

Principles of diagnostic enzymes, factors affecting the enzyme levels in blood. Principle, assay and clinical significance of transaminases, phosphatases, lactate dehydrogenases and creatine kinase. Enzyme pattern in diseases-myocardial infarction and hepatobilary diseases.

UNIT V (12 Hrs)

Liver function tests. Cirrhosis, jaundice, hepatitis and fatty livers. Renal function tests and related disorders. Stones-gall stones, renal stones and its examination.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Thomas M. Devlin (2002), Text book of Biochemistry with Clinical Correlations, 5th ed., A John Wiley and Sons, Inc Publications.
2. M. N Chatterjee and Rana Shinda (2005), Text book of Medical Biochemistry, Jaypee Brothers, Medical Publishers Private Ltd. New Delhi

Reference Books:

1. Harold Varley (2005), Practical Clinical Biochemistry, 4th ed., CBS Publishers and Distributors, New Delhi.
2. Ambika Shanmugam (2016), Fundamentals of Biochemistry for Medical Students, 8th ed., Lippincott Wiliams & Wilkins, Authur, III Cross Street, West C.I.T. Nagar, Chennai – 600 035. .
3. A.C. Deb (2011), Fundamentals of Biochemistry, 9th ed., New Central Book agency (P) Ltd India.
4. J.L.Jain, Sanjay Jain, Nitan Jain (2007), Fundamentals of Biochemistry, S Chand and Company, India.
5. Carl A Burtis, Edward R Ashwood (2012), Tietz Text book of Clinical Biochemistry, 5th ed.,W. B Saunders Company, USA.

UBC-85

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	H	S	M	S
CO3	S	H	H	S	H
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-86

Programme Code: 07	B.Sc Biochemistry		
Major elective –PRINCIPLES OF PHARMACOLOGY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To make the students to understand the basic principles of pharmacology.
2. To learn the concepts regarding the pharmacokinetics, pharmacodynamics and pharmacotherapy.

Course Outcomes (CO)

K1	CO1	Describe the basic principles of pharmacology
K2	CO2	Explain different modes of drug transport, absorption and bioavailability
K3	CO3	Analyze the mechanism of pharmacokinetics and pharmacodynamics of drugs
K4	CO4	Assess the primary aspects of pharmacotherapy

Total Hours: 60

UNIT I (12 Hrs)

Introduction, definition – Pharmacodynamics, pharmacokinetics*. Drug, Pharmacotherapeutics, clinical pharmacology, chemotherapy, pharmacy and toxicology.

Routes of drug administration. Local routes and systematic routes.

UNIT II (12 Hrs)

Pharmacokinetics: Biological membrane, membrane transport – Passive diffusion, filtration. Specalized transport – carrier transport.

Absorption – Oral, subcutaneous and intramuscular and topical sites.

Bioavailability, distribution, redistribution penetration into brain and CSF, plasma protein binding.

UNIT III (12 Hrs)

Pharmacokinetics: Biotransformation – nonsynthetic reactions, oxidation, reduction, hydrolysis, cyclization and de - cyclization.

Synthetic reduction – Glucuronide conjugation, acetylation, methylation, sulfate conjugation, glycine conjugation, glutathione conjugation, microsomal enzyme induction.

Excretion – renal excretion.

UNIT IV (12 Hrs)

Pharmacodynamics: Principles of drug action, mechanism of drug action – enzymes, ion channels, transporters, receptors transducer mechanisms – G – protein coupled receptors, receptors with intrinsic ion channel, enzyme – linked receptors, receptors regulating gene expression.

UNIT V (12 Hrs)

Aspects of pharmacotherapy: Drug dosage, factors affecting drug action rational use of medicines.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Tripathi K.D. (2010), Essentials of Medical Pharmacology, 6th ed., Jaypee Brothers, Medical Publishers Private Ltd, New Delhi.
2. William Foye (2002), Principles of Medicinal Chemistry, 7th ed., Lippincott Williams and Wilkins, Philadelphia , USA.
3. R.S. Satoskar, Nirmala N. Rege and S.D. Bhandarkar. (2011). Pharmacology and Pharmacotherapeutics, 22nd ed., Popular prakashan private limited, Mumbai.

Reference Books:

1. George M. Brenner, Craig W. Stevens. (2010). Pharmacology, 3rd ed., Rajkamala electric press, Haryana.
2. Dr. V. N. Sharma. (2009). Essentials of pharmacology, 3rd ed., CBS publishers and distributors, New Delhi, India.

3. Partrick L. Graham (2013). An Introduction to Medicinal Chemistry. Oxford University press, New York.
4. Grahame, D.G. Smith and Aronson. J (2002), Oxford Text Book of Clinical Pharmacology and Drug Therapy, 3rd ed., Oxford University Press, New York.
5. S.N. Khosla (2008), Essentials of Medicine, 1st ed.,CBS publishers, New Delhi.

* *Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	M	H	S	H	S
CO3	S	H	H	S	H
CO4	H	M	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-89

Programme Code: 07	B.Sc Biochemistry		
Major elective- BASICS OF BIOINFORMATICS			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To know about various tools for database search.
2. To acquire knowledge about different biological databases.
3. To provide knowledge about Gene prediction and drug designing.

Course Outcomes (CO)

K1	CO1	Recognize the available bioinformatics resources on web like DNA and protein databases
K2	CO2	Understand concepts of similarity searching databases and algorithms
K3	CO3	Construct genome annotations and algorithms
K4	CO4	Outline the concepts of structure based drug design, protein structure levels and databases

Total Hours: 60

UNIT I (12 Hrs)

Bioinformatics -Overview and application. Bioinformatics resources on web*. PubMed .Nucleic acid databases GENBANK, DDBJ and EMBL. Sequence submission and file formats. Protein sequence data bank SWISSPROT,UNIPROT. Data mining of biological database with ENTREZ.

UNIT II (12 Hrs)

Data base similarity searching –Local and Global alignment. BLAST and FASTA. Similarity searching algorithms and program, dot plot, scoring matrices and substitution matrices-PAM and BLOSUM.

UNIT III (12 Hrs)

Genome annotation- analysis of regulatory regions in genome- promoters, splice site, termination signals. ORF prediction. Algorithms for gene prediction.

UNIT IV (12 Hrs)

Protein structure-levels, basic physio chemical properties, Mol weight, amino acids, transmembrane region and tools in ExPASY. Protein structure databases:CATH and SCOP. Secondary structure prediction: Chou–Fasman and GOR methods. Tertiary structure prediction.3D structure prediction-homology modeling, Threading, Fold recognition and Abinitio protein structure prediction method.

UNIT V (12 Hrs)

Molecular visualization tools RasMol and Chime. Structure based drug design, target-identification, validation; ligands, docking.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text books:

1. Rastogi. S. C, Namita – Mendiratta and Parag Rastogi, (2004) BioInformatics – Concepts, Skills and applications, Rastogi Publications, Meerut, India.
2. Ignatchimuthu, S, (2009), Basic Bioinformatics, Narosa Publishing House Pvt Ltd, New Delhi.
3. Ruchi Singh (2014). Bioinformatics: Genomics And Proteomics. S. Chand & Company Pvt. Ltd. New Delhi.

Reference books:

1. Attwood. T. K. Parry D.J. and Smith (2001). Introduction to BioInformatics, Prentice Hall Publishers, Pearson Education, India.

2. Mani.K and Vijayaraja (2005), BioInformatics – A practical Approach, Aparna Publications, Coimbatore.
3. Dr. P. Shanmughavel, (2006), Trends in Bioinformatics, Pointer Publishers, Jaipur, India.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	H	S	H	S
CO3	S	H	H	S	H
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-92

Programme Code: 07	B.Sc Biochemistry		
Major elective- DAIRY BIOCHEMISTRY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To understand the basic concepts of dairy technology.
2. To provide knowledge about the milk processing techniques.

Course Outcomes (CO)

K1	CO1	Recognize the properties of milk.
K2	CO2	Recall the methods of testing density, fat content and acidity of milk.
K3	CO3	Analyze the carbohydrates, lipids, proteins and enzymes present in milk.
K4	CO4	Acquire knowledge about the various milk products available and milk processing techniques practiced.

Total Hours: 60

UNIT I (12 Hrs)

Milk- Definition of milk*, physical properties-acidity, viscosity, freezing point and boiling point. Composition of milk, Nutritive value of milk. Vitamins and minerals in milk. Assessment of quality of milk- Density of milk (Lactometer), Determination of fat content (Butyrometer), Acidity of milk (Alcohol test).

UNIT II (12 Hrs)

Carbohydrates- Types of sugars in milk and their importance.

Lipids-Different types of lipids in milk, structure and size of fat globules, physical properties of milk fat.

UNIT III (12 Hrs)

Proteins- Milk protein chemistry. Different types of proteins-Caseins, Caesinate complex, Whey

proteins. Production and forms of whey proteins-α-lactalbumin, β-lactoglobulin and other proteins.Determination of protein fraction in milk- Polyacrylamide gel electrophoresis.

UNIT IV (12 Hrs)

Enzymes of milk.Effect of heat on protein, fat and sugar - protein mixture of milk.

Milk products : Non fermentable products-Whey protein concentrate, Skim milk, Evaporated milk, Sweetened condensed milk, Dry milk, Khoa, Rabri, Ice cream, Standardised milk, Tonned milk, Double tonned milk, Sterilised milk, Flavoured milk, Cream and Colostrum.

Fermentable milk products-Butter, Cheese and Curd.

UNIT V (12 Hrs)

Processing of milk - clarification, pasteurization- HTST & UHTS, role of alkaline phosphatase in pasteurization, effects of pasteurization .Homogenization of milk.

Microbial spoilage of milk - steps involved in spoilage of milk. General types of microorganisms of milk and their biological importance. Pathogenic microorganisms in milk (any five). Fermentation of milk.

Text Books

1. B. Srilakshmi (2007), Food Science, 4th ed., New age international (P) Limited Publishers, New Delhi, India.

Reference books

1. Dr. M. Swaminathan (2006), Handbook of Food and Nutrition, 5th ed., Bangalore Printing and Publishing Co. Limited, Bangalore.
2. R.C. Dubey and D.K. Maheshwari (2005), A Text book of Microbiology, S Chand and Company Ltd, New Delhi.

** Questions may also be taken from the self study portion*

UBC-94

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	H
CO2	S	S	S	S	S
CO3	S	H	H	S	H
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-95

18UBC3A3

Programme Code: 07		For B.Sc Zoology		
Course Code: 18UBC3A3		ALLIED BIOCHEMISTRY I		
Batch 2018-2019	Semester III	Hours / Week 5	Total Hours 75	Credits 4

Course Objectives

1. To make the students to understand the basic principles of biochemistry.

2. To learn about the mechanism of action of enzymes in the biological system.

Course Outcomes (CO)

K1	CO1	Understands the properties, types and functions of carbohydrates, proteins, lipids, enzymes, nucleic acids and their and functions.
K2	CO2	Remembers the structures of monosaccharides, dissaccharides and polysaccharides and aminoacids
K3	CO3	Applies the concept of enzymatic activity in biological system.
K4	CO4	Acquire knowledge about the nuclear organization of prokaryotes in eukaryotes.

Total Hours :75

UNIT I (15 Hrs)

Carbohydrates

Carbohydrates**:** Definition and Classification. Monosaccharides – Structural aspects-asymmetric carbon atom, D and L isomers, anomers, optical activity and mutarotation. Epimers: pyranose and furanose forms, aldo and keto forms, classification, definition, structure and biological importance.
Hexoses: glucose, fructose, galactose and mannose. Pentoses: Ribose and deoxyribose.
Disaccharides: Maltose, sucrose and lactose.

Polysaccharides: Homopolysaccharides: Starch, glycogen, cellulose, inulin and chitin, Heteropolysaccharides: Heparin, hyaluronic acid, chondroitin sulphates. Reactions of monosaccharides- Oxidation of glucose (aldonic acid, aldaric acid and uronicacid).

Action of alkalies with sugars, Reducing action of sugars in alkaline solution and reaction with phenyl hydrazine.

UNIT II (15 Hrs)

Lipids: Classification and properties of lipids. Types of fatty acids: saturated and unsaturated: essential fatty acids. Classification and significance of phospholipids: Phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine, phosphatidyl inositol and sphingomyelin.

Classification and significance of glycolipids: Cerebrosides and gangliosides. Classification and functions of lipoproteins. Structure and biological functions of cholesterol.

UNIT III (15 Hrs)

Amino acids: Classification of amino acids (chemical nature). Essential and non-essential amino acids*. Reactions of aminoacids: actions of amino group with benzoic acid, ninhydrin, fluorodinitrobenzene (FDNB) and carbondioxide.

Reactions of carboxyl group – decarboxylation and amide formation.

Proteins: Definition, classification (chemical nature) and functions of proteins. Structure of proteins- Primary ,secondary, tertiary (myoglobin)and quarternary (hemoglobin).

Denaturation and renaturation of proteins. Ampholytes and isoelectric pH.

UNIT IV (15 Hrs)

Enzymes: Definition, classification and nomenclature of enzymes by IUB , Enzyme units (IU) with examples. Enzyme kinetics- Derivation of Michealis- Menton Equation (single substrate),properties of enzymes,enzyme specificity,mechanism of enzyme action. Theories proposed for the enzyme action- Lock and Key model,induced fit mechanism. Active site and its characteristic features. Factors affecting enzyme activity – Effect of pH, temperature, substrate concentration and enzyme concentration. Types of inhibition of enzyme action – Competitive, non – competitive ,uncompetitive inhibition and feed back inhibition. Coenzymes-definition and any five examples. Cofactors- definition and any five examples.

UBC-97

18UBC3A3

UNIT V (15 Hrs)

Nucleic acids: Components, structure of purine bases: Adenine and guanine. Structure of pyrimidine bases: Cytosine, uracil and thymine. Structure of nucleoside and nucleotide. Double helical structure of DNA. Type of bonds of DNA molecule. Denaturation and renaturation of DNA. Structure and types of RNAs: mRNA, tRNA and rRNA.

Nuclear Organization of DNA in Prokaryotes (bacteria) and eukaryotes (humans)

Teaching Methods

Chalk and board/ Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. A.C. Deb (2011), Fundamentals of Biochemistry, 9th ed., New Central Book Agency Pvt.Ltd. Kolkata.

2. Ambika Shanmugam (2008), Fundamentals of Biochemistry for medical students. 7th ed., Lippincott Wiliams & Wilkins, Authur, III Cross Street, West C.I.T. Nagar, Chennai – 600 035.

3. Lehninger.L.A(2008),Principles of Biochemistry ,W.H .Freeman publishers, India.

Reference Books:

1. M.N. Chatterjee and Rana Shinda (2005), Text book of Medical Biochemistry, Jaypeebrother medical publishers Pvt Ltd. New Delhi.

2. J.L. Jain, Sanjay Jain and Nitin Jain (2007), Elementary Biochemistry, 3rd ed., S Chand and company Ltd, New Delhi.

3. David L. Nelson, Micheal M. Cox (2008), Lehninger's Principles of Biochemistry, Replika press (P) Ltd, India.

4. Robert K. Murray, Daryl K. Garner and Victor W. Rodwell (2008), Harper's Illustrated biochemistry, 29th ed., Appleton and Lange Stanford, Connecticut, USA.

**Question for Examination may also be taken from the self study portion*

UBC-98

18UBC3A3

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	H	S	S	M	S
CO3	S	H	H	S	H
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-99

18UBC4A4

Programme Code: 07		For B.Sc Zoology		
Course Code: 18UBC4A4		**Title:** ALLIED BIOCHEMISTRY II		
Batch 2018-2019	Semester IV	Hours / Week 5	Total Hours 75	Credits 4

Course Objectives

1. To learn about the various biochemical techniques applicable in both research and clinical laboratories.

2. To provide knowledge on metabolic reactions involved in biological reactions.

Course Outcomes (CO)

K1	CO1	Remember the concept of pH and buffer system.
K2	CO2	Understand the idea about the working principle of various analytical techniques.
K3	CO3	Deploy the activity of radioisotopes and their applications in biological system.
K4	CO4	Interpret the metabolic pathways of various molecules.

Total Hours: 75

UNIT I (15 Hrs)

Buffers and buffer system:

Buffers: Definition. Concept of ionization, pKa, pH and derivation of Henderson-Hasselbalch equation, Acid- base indicators. Components and working of pH meter. Buffer systems of blood and body fluids; Mechanism of action of bicarbonate buffer system and phosphate buffer system.

Various ways of expressing the concentration of solutions - Normality, Molarity and percentage solutions.*

UNIT II (15 Hrs)

Colorimetry,Chromatography and Electrophoresis.

Colorimetry – Beer and Lambert's law. Instrumentation and working of photoelectric colorimeter (single cell) and spectrophotometer.Comparison of colorimeter and spectrophotometer. Chromatography-Definition, Rf factor, Principle and technique of paper chromatography with reference to separation of aminoacids,molecular sieve chromatography(with reference to separation of proteins).

Electrophoresis-Definition, factors affecting mobility of ions in electric field, principle and working of PAGE (polyacrylamide gel electrophoresis) with reference to separation of serum protein separation and SDS-PAGE (sodium do decyl sulphate-PAGE) with reference to separation of protein subunits. Role of protein solubilizers.

UNIT III (15 Hrs)

Centrifugation and Radioactivity.

Centrifugation- Principle and types. Technique and applications of Ultra centrifuge, Density gradient centrifuge and Differential Centrifugation

Radioactivity – Isotopes-definition and different types. Definition of radioactivity. Types of radioactive decay (alpha and beta(negatron and positron) particles ,and emission of gamma rays and x rays).

Units of radioactivity (Curie, Rutherford and Becquerel) . Measurement of radioactivity - Geiger–Muller counter and autoradiography. Applications of radioisotopes in biological sciences and medical sciences.

UNIT IV (15 Hrs)

Metabolic pathways, lipid and protein metabolism.

Metabolic pathways: Carbohydrate metabolism: Glycolysis, TCA cycle, HMP shunt, Glycogenesis and glycogenolysis.

Lipid metabolism: Beta-oxidation, biosynthesis of saturated fatty acids- Palmitic acid.

Protein metabolism: General pathway of amino acid metabolism – deamination, transamination and decarboxylation. Urea cycle.

Interrelationship of carbohydrate,fat and protein metabolism (flow chart only)

UBC-101

18UBC4A4

UNIT V (15 Hrs)

Bioenergetics ,respiratory chain and oxidative phosphorylation.

Bioenergetics: Definition. Entropy, enthalpy and free energy; high-energy phosphates. Biological oxidation– Definition and redox potential.

Respiratory chain (Electron Transport Chain)- Components of ETC ; Transport of electrons in respiratory chain .

Oxidative phosphorylation- Definition. Sites of oxidative phosphorylation in ETC; Mechanism – Chemiosmotic hypothesis.

Caloric value of metabolism.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. P. Asokan, (2006), Basics of Analytical Biochemical Techniques, Chinna Publications, Tamil Nadu.

2. A.C. Deb (2011), Fundamentals of Biochemistry, 9th ed., New Central Book Agency Pvt. Ltd. Kolkata.

3. Satyanarayana.U and Chakrapani,U (2013),Biochemistry,4th ed., Books and allied pvt.Ltd,Kolkata.

Reference Books:

1. Keith Wilson and John walker (2011), Principles and Techniques of Biochemistry and Molecular Biology. 7th ed., Cambridge University Press, New York.

2. Robert K. Murray, Daryl K. Garner and Victor W. Rodwell (2008), Harper's Illustrated Biochemistry, 29th ed., Appleton and Lange Stanford, Connecticut, USA.

3. Ambika Shanmugam, (2008), Fundamentals of Biochemistry for Medical Students'. 7th ed., Lippincott Wiliams & Wilkins, Authur, III Cross Street, West C.I.T. Nagar, Chennai – 600 035.

4. Garrette,R.H and Grisham,L.M.(2012),Principles of biochemistry, 5th ed, Saunders College Publishers, USA.

**Question for Examination may alsobe taken from the self study portion*

UBC-102

18UBC4A4

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	M
CO2	S	S	S	S	S
CO3	S	S	H	S	H
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

UBC-103

18UBC4AL

Programme Code: 07		For B.Sc Zoology		
Course Code: 18UBC4AL		A.Pr.2. BIOCHEMISTRY		
Batch 2018-2019	Semester III & IV	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To acquire the skill of analyzing carbohydrates and amino acids.
2. To provide practical knowledge about the characterization of lipids.
3. To learn the methodology of separation of amino acid by paper chromatography.

Course Outcomes (CO)

K3	CO1	Practice the qualitative analysis of different carbohydrates and amino acids through individual experiments
K4	CO2	Calculate acid and iodine number of lipids, thereby characterizing them
K5	CO3	Assess the separation technique of amino acids through paper chromatography

Total Hours: 30

List of Programs

1. QUALITATIVE ANALYSIS

1. Analysis of carbohydrates:

a. Monosaccharides- Pentose- Arabinose. Hexoses- Glucose and fructose

b. Disaccharides- Sucrose, maltose and lactose

c. Polysaccharide-Starch.

2. Analysis of Amino acids:

a. Histidine b. Tyrosine. c. Tryptophan d. Arginine e. Cysteine

II. CHARACTERISATION OF LIPIDS [Group experiments]

- Determination of acid number.
- Determination of iodine number.

III. SEPARATION TECHNIQUE [Demonstration]

Separation of amino acids by paper chromatography

Reference Books:

1. Sadhasivsam. S and Manickam. A. (2008), Biochemical Methods, revised 2nd ed., New age International Publishers, India.

2. Jeyaraman. J. (1992), Laboratory Manual in Biochemistry, 4th Reprint Wiley Eastern Ltd, New Delhi.

3. Gupta R.C. and Burghava S. (1992), Practical Biochemistry, CBS Publishers and Distributors, New Delhi.

4. David T Plummer. (1995), An Introduction to Practical Biochemistry, Tata McGraw Hill publishing Co Ltd, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	S	H	S
CO3	S	S	H	S	H
CO4	H	S	S	H	M

S – Strong **H** – High **M** – Medium **L** – Low

UBC-105

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE – 641 029.

AFFILIATED TO BHARATHIAR UNIVERSITY

DEPARTMENT OF BIOCHEMISTRY (UG)

CERTIFICATE COURSE IN MUSHROOM TECHNOLOGY

(Curriculum and scheme of examination applicable to students admitted from the academic year 2018-19 onwards)

Subject code/ Question paper code	Title of the Paper	Lecture hours	Exam marks			Duration of exam	Credits
			CIA	ESE	Total		
18CMT0C1	Mushroom Science	30 Hrs	-	100	100	3	2
18CMT0C2	Mushroom Cultivation	30 Hrs	-	100	100	3	2
18CMT0C3	Practical	30 Hrs	-	100	100	3	2
18CMT0C4	Project work	30 Hrs	-	100	100	-	2
Total		**120**			**400**		**8**

CIA- Continuous Internal Assessment; ESE- End of Semester Examinations

UBC-106

18CMT0C1

Programme Code:07	B.Sc Biochemistry		
Course Code: 18CMT0C1	MUSHROOM SCIENCE		
Batch 2018-2019	Hours / Week 2	Total Hours 30	Credits 2

OBJECTIVES:

1. To learn the basics of mushroom biology
2. To learn the nutritional and medicinal properties of mushrooms
3. To learn the morphology and life cycle of mushrooms

UNIT – I **(12 Hours)**

Mushrooms: Introduction, biodiversity, edible and non-edible species, systematic position, distribution and morphology. Nutritional and physical requirements for growth. The role of mushrooms in nature: saprobes, parasites, mycorrhiza formers. Status of mushroom cultivation, Advantages of mushroom cultivation for India, scope of mushroom cultivation and marketing.

UNIT – II **(12 Hours)**

Mushroom Formation: Role of environmental factors (Hydrogen Ion Concentration (pH), Temperature, Aeration, Light, Gravity), Nutritional Factors (Concentration of Nutrients, Nature of Carbohydrate, Nitrogen, Mineral Nutrition, Vitamins) and Chemical Factors.

Submerged Cultivation of Mushrooms (SCM): Introduction, Concept of SCM, Methods and Techniques of SCM, Physical, Chemical and biological factors that Influence the SCM. Cultivation of Medicinal Fungi in Bioreactors: Introduction, Overview of Cultivation Technologies, Production of Biomass in Bioreactors, Submerged Bioprocessing and Solid-State Bioprocessing.

UNIT – III **(12 Hours)**

Nutritional and medicinal significance of mushrooms: Nutritional composition (protein, essential amino acids, fat, vitamins, carbohydrates and fiber, minerals and nucleic acids) and significance of edible mushrooms; Medicinal properties of edible mushrooms - Anti-tumor, Anti-viral, Hypocholesterolemic, Antibiotic, Anti-inflammatory activities and Tonic.

UBC-107

18CMT0C1

UNIT – IV **(12 Hours)**

Mushroom Tissue Culture Technology: Commonly used growth media, preparation of media, methods of isolation of mushroom tissue, inoculation, mycelial growth, storage and preservation of cultures. Revival of cultures, subculturing methods. Factors affecting the growth of mycelial cultures. Equipments for mushroom tissue culture process.

UNIT – V **(12 Hours)**

Mushroom Spawn Production Technology: Definition and history of spawn. Types of substrates used for spawning. Mode of spawning: liquid and solid spawning. Spawn production process: selection of substrate, processing of substrate, preparation of spawn packet, sterilization, inoculation of culture, growth and maturity of spawn. Preparation of mother spawn, F_1 and F_2 generation spawn. Factors affecting the spawn production process. Infrastructural facilities required for spawn production. Economics of spawn production.

Text Book:

1. Better life with mushrooms (2014), S. Krishnakumari and S. Kathiravan, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.

References:

1. Mushroom Cultivation, Tripathi, D.P. (2005) Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
2. PathakYadavGour (2010). Mushroom Production and Processing Technology, Published by Agrobios (India).
3. Nita Bahl, 2002. Hand Book on Mushroom 4th edition. Vijay Primlani for oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Training Manual on Culture Techniques & Spawn Production (2017), S. Krishnakumari, S. Kathiravan, M. Karthik, V. Suganthi, and B. Krishna, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.
5. Shu-Ting Chang and Philip G. Miles (2004) Mushrooms -Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact.2nd edition. CRC Press LLC.
6. Philip G. Miles and Shu-Ting Chang. Mushroom Biology Concise Basics and Current Developments (1997). World Scientific Publishing Co. Pte. Ltd.
7. Marian Petre (2016). Mushroom Biotechnology. Developments and Applications. 1st edition. Academic Press. USA.

UBC-108

18CMT0C2

Programme Code:07	B.Sc Biochemistry		
Course Code: 18CMT0C2	MUSHROOM CULTIVATION		
Batch 2018-2019	Hours / Week 2	Total Hours 30	Credits 2

OBJECTIVES:

1. To learn the various aspects of mushroom tissue culture technology.
2. To know about the processes involved in mushroom spawn production.
3. To learn the technology of oyster and milky mushroom cultivation.
4. To create an awareness on management of post mushroom substrate.
5. To get involved in value added product production from mushrooms.

UNIT –I **(12 Hours)**

Technology of Oyster Mushroom Cultivation: Infrastructural facilities required for oyster mushroom cultivation. Substrates used for cultivation. Process of cultivation: Sterilization of cultivation chamber, selection of substrate, processing, sterilization, packing of substrate, spawn inoculation, spawn running, maintenance of temperature and humidity, harvest of mushrooms and packing of mushrooms. Economics of oyster mushroom cultivation.

UNIT – II **(12 Hours)**

Technology of Milky Mushroom Cultivation: Infrastructural facilities required for milky mushroom cultivation. Substrates used for cultivation. Process of cultivation: Sterilization of cultivation chamber, selection of substrate, processing, sterilization, packing of substrate, spawn inoculation, spawn running, maintenance of temperature and humidity, casing process, harvest of mushrooms and packing of mushrooms. Economics of milky mushroom cultivation.

UNIT –III **(12 Hours)**

Mushroom Disease Management:biotic factors responsible for disorders: Nematodes, Parasitic fungi, Antagonistic fungi, Pathogenic bacteria, virus, Viroids, mycoplasmas, and rickettsias. Abiotic factors responsible for disorders.

UNIT- IV **(12 Hours)**

Management of Post Mushroom Substrate (PMS): Use of Post Mushroom Substrate in soil reclamation, organic fertilizer, source for biogas production, animal feed, casing material

for mushroom cultivation, vermicompost production and other uses. Societal and Environmental impact of PMS management.

Value addition to mushrooms: Preparation of soups, soup powder, biscuit, pickles, ketchup, candy, chips, instant food items and bakery products. Equipment's required for value addition to mushrooms.

UNIT –V (12 Hours)

Strategies for successful and sustainable mushroom trade: Marketing channels, Marketing strategies, Processing, Organization, Accessing market information, Education, business skills and a willingness to take risks, Diversification options, Business and entrepreneurial skills and Sustainable mushroom trade.

Text Book:

1. Better life with mushrooms (2014), S. Krishnakumari and S. Kathiravan, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.

Reference Books:

1. Mushroom Cultivation, Tripathi, D.P. (2005) Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
2. PathakYadavGour (2010). Mushroom Production and Processing Technology, Published by Agrobios (India).
3. Nita Bahl, 2002. Hand Book on Mushroom 4th edition. Vijay Primlani for oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Training Manual on Culture Techniques & Spawn Production (2017), S. Krishnakumari, S. Kathiravan, M. Karthik, V. Suganthi, and B. Krishna, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.
5. Elaine Marshall and N. G. (Tan) Nair. (2009) make money by growing mushrooms. Rural Infrastructure and Agro-Industries Division, Food and Agriculture Organization of the United Nations. Rome.
6. Shu-Ting Chang and Philip G. Miles (2004) Mushrooms -Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact.2nd edition. CRC Press LLC.
7. Philip G. Miles and Shu-Ting Chang. Mushroom Biology Concise Basics and Current Developments (1997). World Scientific Publishing Co. Pte. Ltd.
8. Marian Petre (2016). Mushroom Biotechnology. Developments and Applications. 1st edition. Academic Press. USA.

UBC-110

18CMT0C3

Programme Code:07	B.Sc Biochemistry		
Course Code: 18CMT0C3	PRACTICAL - LAB IN MUSHROOM CULTIVATION		
Batch 2018-2019	Hours / Week 2	Total Hours 30	Credits 2

OBJECTIVES:

1. To provide a hands-on training on the technologies of mushroom tissue culture, spawn production and cultivation.
2. To equip the students with the different techniques and instrumentation.

I. Tissue culture, spawn and mushroom production techniques

1. Sterilization of tissue culture and spawn production utensils.*
2. Media preparation for mushroom tissue culture. *
3. Inoculation of the tissue/culture into the culture media.
4. Subculturing of mycelia from slant/petriplate.
5. Mushroom spawn preparation*
6. Preparation of F_1 and F_2 generation from mother spawn*
7. Substrate processing for mushroom production.*
8. Making of mushroom beds.*

II. Analysis of primary and secondary metabolites

9. Estimation of primary metabolites from powdered mushroom sample.
    a. Carbohydrate
    b. Starch
    c. Total protein
10. Estimation of primary metabolites from powdered mushroom sample.
    a. Phenols
    b. Flavonoids

UBC-111

18CMT0C3

Text Book:

1. S.Sadasivam and A.Manikam (2005). Biochemical Methods. 2nd edition. New Age International (P) Limited Publishers. New Delhi.

References:

1. Mushroom Cultivation, Tripathi, D.P. (2005) Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi.
2. PathakYadavGour (2010). Mushroom Production and Processing Technology, Published by Agrobios (India).
3. Training Manual on Culture Techniques & Spawn Production (2017), S. Krishnakumari, S. Kathiravan, M. Karthik, V. Suganthi, and B. Krishna, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.

UBC-112

KONGUNADU ARTS AND SCIENCE COLLEGE(AUTONOMOUS)

COIMBATORE-29

CHOICE-BASED CREDIT SYSTEM

QUESTION PAPER PATTERN FOR PART III B.Sc BIOCHEMISTRY

FOR ALL SIX SEMESTERS

Time: 3 hours **Max.Marks: 75**

Section A (10x1= 10 marks)

Q. No: 1-10

Multiple-choice questions with four choices to be taken from all units in the prescribed syllabus

Section B (5x 5 =25 marks)

Q.No:11-15

Five paragraph questions (either – or type in about 150 words each) to be taken from all the units in the prescribed syllabus.

Section C (5x 8= 40 marks)

Q.No: 16-20

Five essay type questions (either – or type in about 500 words each) to be taken from all the units in the prescribed syllabus.

UBC-113

KONGUNADU ARTS AND SCIENCE COLLEGE(AUTONOMOUS)

COIMBATORE-29

CHOICE-BASED CREDIT SYSTEM.

QUESTION PAPER PATTERN FOR PART III Allied.B.2 BIOCHEMISTRY

FOR THIRD AND FOURTH SEMESTER

18UBC3A3 & 18UBC4A4

Time: 3 hours **Max.Marks: 55**

Section A (10x1= 10 marks)

Q. No: 1-10

Multiple-choice questions with four choices to be taken from all units in the prescribed syllabus

Section B (5x 3 = 15marks)

Q.No:11-15

Five paragraph questions (either – or type in about 150 words each) to be taken from all the units in the prescribed syllabus.

Section C (5x 6= 30 marks)

Q.No:16-20

Five essay type questions (either – or type in about 500 words each) to be taken from all the units in the prescribed syllabus.

UBC-114

Part IV – I Semester

ENVIRONMENTAL STUDIES

18EVS101

Question Paper Pattern

(External only)

Duration: 3 hours Total Marks: 50

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

UBC-115

Part IV – II Semester

Value Education – Moral and Ethics

18VED201

Question Paper Pattern

(External only)

Duration: 3 hours Total Marks: 50

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

UBC-116

Part IV – III Semester

18UGA3S1

Skill Based Subject 1 – GENERAL AWARENESS (ONLINE)

Question Paper Pattern

Max. Marks 100

End of Semester Examination (ESE)- On-Line Examination **75 Marks**

1. 150 questions are to be given. Each question carries ½ mark.

2. In each unit, 30 questions are to be given, covering all the 5 units.

Continuous Internal Assessment (CIA) (through On-Line) **25 Marks**

a) Two Exams.	15 Marks
b) Assignment**	5 Marks
c) Attendance	5 Marks

** Each student has to submit an assignment in the Current Affairs area.

UBC-117

PART IV – SEMESTER III and IV

NON – MAJOR ELECTIVES I AND II

(2018 - 2019)

18UHR3N1 & 18UWR4N2

QUESTION PAPER PATTERN

Duration : 3 hours **Max.Marks: 75**

Answer ALL Questions

SECTION A (5X5 = 25 marks)

Short answers, either or type, one question from each unit.

SECTION B (5 X 10 = 50 marks)

Essay type questions, either or type, one question from each unit.

UBC-118

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE-29

B.Sc DEGREE PRACTICAL EXAMINATION MARCH/ APRIL 2019

PART III CORE AND ALLIED BIOCHEMISTRY PRACTICALS

APPLICABLE TO STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2018-2019

GENERAL GUIDELINES TO EXAMINERS

All matters concerned with practical examination have to treat as strictly confidential.

Both the examiners are jointly responsible in conducting practical examination. Preparing, conducting and valuing are to be done in accordance with the general and specific instruction issued.

PREPARATION FOR EXAMINATION:

Question papers and valuation schemes for various batches of practical examinations as per time- table have to be collected from the principal / chief Superintendent of the center. Preparation of solutions and packing of substances are to be one as per the requirement of the questions and the number of candidates registered in the batch on the previous day/ session in advance after receiving the concerned question paper cover. Prepared solutions and substances should be kept under safe custody. Values of weights and volumes names of substances etc are to be preserved confidentially by the examiners.

CONDUCT OF EXAMINATIONS:

Seats for candidates are to be marked by numbers serially and the required apparatus/ instruments to be provided at the places. Candidates have to be admitted into the laboratory in time after verifying their hall tickets and identity cards. Seats have to be allotted to the candidates in batch by lot system. One main book one additional book if needed a graph sheet, log table and O.D. chart etc shall be kept on the table noted against the sample number.

Marks ten shall be allotted for the write up of principle, brief procedure and indication of calculation of the experiment allotted to the candidate, written within thirty minutes for six hours

and 15 minutes for three hours duration practicals in the additional book provided to them, collected immediately and valued by the examiners.

The examiners shall dictate to the candidates an outline of the procedure to the adopted for volumetric and colorimetric experiment

GENERAL GUIDELINES TO EXAMINERS IN BIOCHEMISTRY

Examiners should supervise the candidates while carrying out the experiments. Reporting of result alone at the end of the practical examination session should not be taken as an indication for having carried out the experiment properly. For qualitative analysis confirmatory tests should be shown to the examiner by the student.

Volumes and colorimetric readings have to be attested by the examiners as and when reported to them by the candidates before completing the final calculations.

VALUATION OF RECORD NOTE BOOKS

Every candidate should submit a certified bonafide record of practical experiments at the time of his/her first appearance for the practical examination. In case of arrear/ improvement candidates, whose note books were already submitted and valued, a statement to the effect that they have already submitted the records at a previous examination should be obtained from them in the following proforma and the consolidated statement be sent to the controller of examinations at the closure of the practical examinations.

Signature of the Examiners

10% of the total marks of core practical 2, 3, 4 and 5 of each practical examination is allotted for record notebook. The criteria for awarding marks include neatness, regularity in submission, accuracy of result, number of exercises done etc. Record notebook should be signed by both the examiners and punched after valuation.

GENERAL GUIDELINES TO EXAMINERS IN BIOCHEMISTRY FOR QUALITATIVE ANALYSIS

Two systematic analyses have to be carried out in 3 hrs.

Estimations

For three hours practical one experiment has to be carried out.

For six hours practical two experiments have to be carried out.

UBC-120

KONGUNADU ARTS AND SCIENCE COLLEGE(AUTONOMOUS)

COIMBATORE-29

CHOICE-BASED CREDIT SYSTEM.

QUESTION PAPER PATTERN FOR PART III PRACTICAL BIOCHEMISTRY

Core Practical 1 - Biochemistry

18UBC2CL

Time: 3hrs **Max. Marks: 60**

a. Analyse systematically the given unknown sugar solution and write the systematic procedure (20+5 marks).

b. Analyse systematically the given unknown aminoacid solution and write the systematic procedure (20+5 marks).

c. Record – 10 marks

Valuation of answer scripts:

A. Core Biochemistry Practical 1

For qualitative analysis, the following samples shall be given

I – Carbohydrate

Glucose, Fructose, Arabinose, Sucrose, Lactose and Starch

II – Aminoacid

Arginine, Histidine, Tyrosine, Tryptophan and Cysteine

Qualitative Analysis

	Marks	
Analysis I		
Procedure	05	
Tests and Results	20	
Analysis II		
Procedure	05	
Tests and results	20	
Record	10	
Total		60

CIA	**Marks**	
Attendance	5	
Observation notebook&Regularity	10	
CIA model practical test	25	
Total		40

Total		100

UBC-121

QUESTION PAPER PATTERN FOR PART III PRACTICAL BIOCHEMISTRY

Core Practical 2 - Biochemistry

18UBC2CM

Time: 3 hours

Max. Marks: 60 marks

I. a) Estimate the amount of phosphorus present in 100ml of given unknown solution. (Odd numbered candidates) **(OR)**

b) Determine the Km value of the enzyme acid phosphatase by Michaelis- Menton method (Even numbered candidates) (40)

II. Write the procedures assigned to the above experiments. (10)

III. Record submitted (10)

Colorimetric experiment

No.	**Details**	**Marks (Biochemical parameters)**	**Marks (Enzymology)**
1.	Tabular column	5	10
2.	Graph	5	10
3.	Calculation	10	---
4.	Accuracy of result	20	20
5.	Procedure	10	10
6.	Record	10	10
	Total	60	60

CIA

Attendance	5	5
Observation notebook&Regularity	10	10
CIA model practical test	25	25
Total	40	40

Total	100

UBC-122

18UBC6Z1

COMPONENT FOR PROJECT

Maximum marks: 100

CIA/ESE	Particulars	Project out of 100 marks
CIA	Project review	15
	Regularity	5
	Total internal marks	**20**
ESE*	Project report present	60
	Viva voce	20
	Total external marks	**80**
Total marks (CIA+ESE)		**100**

*Project report and viva voce will be evaluated jointly by both the project supervisor (Faculty of department) and an External examiner.

UBC-123

QUESTION PAPER PATTERN FOR PART III PRACTICAL BIOCHEMISTRY

Core Practical 3 - Biochemistry

18UBC6CN

Time : 6 hours

Max. Marks: 60 marks

I. For odd numbered candidates. Estimate the amount of glucose present in 100ml of the urine sample by Benedict's method. **(or)**
For even numbered candidates. Estimate the amount of calcium present in 100ml of the given urine sample by permanganate method. (20)

II. For odd numbered candidates. Estimate the amount of urea present in 100 ml of the given serum sample by DAM-TSC method. **(or)**
For even numbered candidates. Estimate the amount of uric acid present in 100 ml of the given serum sample by caraway method. (20)

III. Write the procedures assigned to the above experiments. (10)

IV. Record submitted (10)

Core Biochemistry practical - 3

Quantitative analysis

I Urine Analysis

No	Details	Marks
1.	Procedure	7
2.	Tabular column	5
4.	Calculation	5
5.	Accuracy of results	8
	Total	**25**

UBC-124

II Blood Analysis

1.	Procedure	5
2.	Tabular column	4
3.	Graph	4
4.	Calculation	4
5.	Accuracy of results	8

Total	**25**
Record	10

Total	**60**

CIA

Attendance	5	
Observation notebook &Regularity	10	
CIA model practical test	25	
Total		40

Total		100

UBC-125

QUESTION PAPER PATTERN FOR PART III PRACTICAL BIOCHEMISTRY

Core Practical 4 –Biochemistry

18UBC6CO

Time: 4 hours **Max. marks: 60 marks**

I. a) Estimate the amount of DNA present in the given sample by Diphenylamine method

(or)

b) Estimate the amount of RNA present in the given sample by Orcinol method **35 marks**

II. a) Using simple staining method determine the microorganism in the given sample

(or)

b) Identify the microorganism in the given sample by the method of gram staining **15 marks**

III. Record **10 marks**

UBC-126

CORE PRACTICAL 4 – BIOCHEMISTRY

ESE

I. Genetic Technology

1. Procedure	10	
2. Tabular column	05	
3. Graph	05	
4. Calculation	05	
5. Accuracy of results	10	
		35

II. Microbiology

1. Procedure	05	
2. Report	10	
		15

III. Record	**10**
	———
Total ESE	**60**

CIA

Attendance	05	
Observation notebook, regularity	10	
Model practical test	25	
		40
		———
Total marks		**100**

UBC-127

QUESTION PAPER PATTERN FOR PART III PRACTICAL BIOCHEMISTRY

Core Practical 5 –Biochemistry

18UBC6CP

Time: 4 hours **Max. marks: 60 marks**

I. a) Estimate the amount of starch present in the given sample

(or)

b) Estimate the amount of total phenols present in the given sample **35 marks**

II. a) Examine the given urine sample whether it contains HCG Hormone

(or)

b) Analyse the serum sample for RA Factor **15 marks**

III. Record **10 marks**

UBC-128

CORE PRACTICAL 5 – BIOCHEMISTRY

ESE

I.	**Plant Biochemistry**	
1. Procedure	10	
2. Tabular column	05	
3. Graph	05	
4. Calculation	05	
5. Accuracy of results	10	
		35
II.	**Immunology**	
1. Procedure	05	
2. Report	10	
		15
III.	**Record**	**10**
		———
Total ESE		**60**

CIA

Attendance	05	
Observation notebook, regularity	10	
Model practical test	25	
		40
		———
Total marks		**100**

UBC-129

QUESTION PAPER PATTERN FOR PART III PRACTICAL BIOCHEMISTRY

Allied Practical 2 - Biochemistry

18UBC4AL

Time : 3 hours

Total: 30 marks

a. Qualitatively analyse the given unknown sugar sample and give the systematic procedure (8+5 marks).

b. Analyse systematically the given unknown amino acid solution and write the procedure (7+5 marks).

c. Record – 5 marks

Allied Practical 2 Biochemistry

For qualitative analysis, the following samples shall be given.

I- Carbohydrate

Pentose, glucose, fructose, sucrose, lactose and starch.

II- Aminoacids

Histidine, Tyrosine, Tryptophan, Arginine and cysteine.

UBC-130

Qualitative Analysis

ESE	**Marks**	
Analysis I		
Procedure	5	
Tests and Results	8	
	13	
Analysis II		
Procedure	5	
Tests and results	7	
	12	
Record		**05**

Total (ESE)		**30**

CIA		
Attendance	5	
Observation notebook&Regularity	5	
CIA model practical test	10	
		20

	Total marks	**50**

UBC-131

QUESTION PAPER PATTERN FOR CERTIFICATE COURSE

MUSHROOM TECHNOLOGY

(External only)

1. THEORY: Max Marks: 100

Time: 3 hrs

SECTION – A (5 x 5=25 marks)

Short answer questions

Q.No. 1-5: Either (a) or (b) short note type (One question 'a' or 'b' from each unit)

SECTION - C (5 x 15=75 marks)

Essay type of questions:

Q.No. 6-10: Either (a) or (b) essay type (One question 'a' or 'b' from each unit)

2. PRACTICAL – Question Pattern & Break-up of marks

END OF SEMESTER PRACTICAL EXAMINATION

Max. Marks: 100

Duration: 3hrs

I. Major (One question)	(1 x 20 = 20)
II. Minor (One question)	(1 x 10 = 10)
III. Spotters	(3 x 5 = 15)

Examine, identify and critically comment on the spotters A, B, C, D and E.

IV. Viva	(05)
V. Record / Observation*	(10)

3. PROJECT: Max. Marks: 100

Project review	(15)
Regularity	(05)
Project report presentation	(60)
Viva voce	(20)

**Record for ESE; Observation for CIA exam.*